Curriculum

CERTIFICATE
in
DIAGNOSTIC RADIOGRAPHY

(Second and Third year)

COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING
Curriculum Development Division
Sanothimi, Bhaktapur

First Revision, 2010
Second Revision 2018

Table of Contents

Introduction:

The Government of Nepal has called for the provision of basic health service to all by establishing a network of health services in all over Nepal. In this regard, the Council for Technical Education and Vocational Training (CTEVT) has been contributing towards the development of different level of health personnel. In the field of Radiography and imaging, CTEVT has been running a program to produce middle level radiography and imaging service providers. The Certificate in Diagnostic Radiography graduates will be able to perform routine works related to technology in different level of hospitals, health institutions and imaging centres.

This program is of three academic years' duration. The first year course focuses on basic science and foundational subjects, the second year course focuses on basic radiography and imaging related subjects and the third year is given to the application of learned skills and knowledge within the comprehensive practical settings in hospitals, health institutions and imaging center recognized by the ministry of health and population or concerned authority.

The foundational subjects like English, Nepali, Physics, Chemistry and Mathematics are applicable for middle level health professional. The disciplinary subjects related to radiography field are included in second and third year. Along with the core radiography practice, the graduates will be capable of providing first aid, basic maternity care and basic public health care. This curricular program also makes the provision of practical exposure as well as real work practices in the specific areas of radiography and imaging technology. The curriculum structure and the subject-wise content reflect the details of this curriculum. In brief, this curriculum will guide to its implementers to produce competent and highly employable middle level technical workforces in the field of radiography and imaging technology.

Curriculum Title:

Certificate in Diagnostic Radiography

Aim:

This program aims to produce middle level technical personnel with sound academic knowledge equipped with perfect technical skills that can be faced in real life situation.

Program Objectives:

After the completion of this program, the graduates will be able to:

- To perform all routine radiography/and assist in special x-ray examination.
- To maintain photographic and x-ray equipment in good working order.
- To possess knowledge on recent advances in imaging technology.
- To protect the patients and staff from possible radiation hazards.
- To maintain records of x-ray examinations, filing of radiographs & ordering of necessary radiographic supplies.
- To provide care of the patients whilst in the x-ray department.
- To prepare radiography set up required for routine and special investigations.
- To practice quality control system in radiology department to deliver quality reports.
- To familiarize middle level radiography management works, supervision of subordinates and preparation of reports.
- To provide basic first aid Treatment.

Group Size:

The group size will be maximum of 30 (Thirty) students in a batch.

Entry Criteria:

- SLC Pass or SEE with GPA 2.00 plus minimum C grade in Compulsory Mathematics, English & Science.
- Should pass entrance examination as administered by CTEVT.
- Enrolment will be made on the basis of merit list.

Medium of Instruction:

The medium of instruction will be in English and/or Nepali.

Course Duration:

The total duration of this curricular program is three years. The program is based on yearly system. Moreover, one academic year consists of 39 academic weeks and one academic week consists up to 40 hours excluding evaluation period.

Pattern of Attendance:

Minimum of 90% attendance in each subject is required to appear in the respective final examination.

Teacher and Student Ratio

The ratio between teachers and students must be:

- Overall ratio of teacher and student must be 1:10 (at the institution level)
- 1:30 for theory and tutorial class.
- 1:10 for practical class.

Qualification of Teachers and Instructors:

- The program coordinator should be a master's degree holder in the related area or a Bachelor degree in the related area with one year teaching experience in related field.
- The disciplinary subject related teacher and demonstrators should be bachelor's degree holder in the related area.
- The foundational subject related teacher should be master degree holder in the related area.

Instructional Media and Materials:

The following instructional media and materials are suggested for the effective instruction and demonstration.

- ***Printed Media Materials*** **(**assignment sheets, case studies, hand-outs, information sheets, individual training packets, procedure sheets, performance checklists, textbooks etc.).
- ***Non-projected Media Materials*** (display, models, flip chart, poster, writing board etc.).
- ***Projected Media Materials*** (Multimedia projector, slides etc.).
- ***Audio-Visual Materials*** (audiotapes, films, slide-tape programs, videodiscs, videotapes etc.).
- ***Computer-Based Instructional Materials*** (computer-based training, interactive video etc.).

Teaching Learning Methodologies:

The methods of teachings for this curricular program will be a combination of several approaches (not limited to as mentioned here) such as illustrated lecture, tutorial, group discussion, demonstration, simulation, guided practice, practical experiences, fieldwork, report writing, term paper presentation, community campaign, case analysis, role-playing, heuristic and other independent learning.

Theory: Lecture, discussion, presentations, seminar, interaction, assignment, group work.
Practical: Demonstration, observation, guided practice, self-practice and clinical practice etc.

Mode of Education:

There will be inductive and deductive mode of education.

Examination and Marking Scheme:

a. Internal Assessment

- There will be a transparent/fair evaluation system for each subject both in theory and practical exposure.
- Each subject will be internal assessment at regular intervals and students will get the feedback about it.
- Weightage of theory and practical marks are mentioned in course structure.
- Continuous assessment format will be developed and applied by the evaluators for evaluating student's performance in the subjects related to the practical experience.

b. Final examination

- Weightage of theory and practical marks are mentioned in course structure.
- Students must pass in all subjects both in theory and practical for certification. If a student becomes unable to succeed in any subject s/he will appear in the re-examination administered by CTEVT.
- Students will be allowed to appear in the final examination only after completing the internal assessment requirements.

c. Requirement for final practical examination

- Professional of relevant subject instructor must evaluate final practical examinations.
- One evaluator in one setting can evaluate not more than 15 students.
- Practical examination should be administered in actual situation on relevant subject with the provision of at least one internal evaluator from the concerned or affiliating institute led by external evaluator nominated by CTEVT.
- Provision of re-examination will be as per CTEVT policy.

d. Final Practicum evaluation will be based on

- Instructional practicum attendance – 10%
- Logbook / Practicum book maintenance – 10%
- Spot performance (assigned task / practicum performance / identification / arrangement preparation / measurement) – 40%
- Viva voce:
  - Internal examiner – 20%
  - External examiner – 20%

e. Pass Mark

- The students must secure minimum 40% marks in theory and 50% marks in practical. Moreover, the students must secure minimum pass marks in the internal assessment and in the final examination of each subject to pass the subject.

Provision of Back Paper:

There will be the provision of back paper but a student must pass all the subjects of all year within six years from the enrolment date; however there should be provision of chance exam for final year students as per CTEVT rules.

Disciplinary and Ethical Requirements:

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by the review of the disciplinary review committee of the institute.
- Dishonesty in academic or practical activities will result in immediate suspension followed by administrative review, with possible expulsion.

- Illicit drug use, bearing arms in institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

Grading System:

The following grading system will be adopted:

- Distinction : 80 % and above
- First division : 65 % to below 80 %
- Second division : 50 % to below 65 %
- Pass division : Pass Marks to below 50 %

Certification and Degree Awards:

- Students who have passed all the components of all subjects of all 3 years are considered to have successfully completed the course.
- Students who have successfully completed the course will be awarded with a degree of **"Certificate in Diagnostic Radiography"**.

Career Opportunity:

The graduates will be eligible for the position equivalent to Non-gazette 1st class / Level 5 (technical) or as prescribed by the Public Service Commission of Nepal and other related agencies. The graduate will be eligible for registration with the related Council in the grade as provisioned in the related Council Act (if any).

Course Structure of Certificate in Diagnostic Radiography

First year

SN	Subject	Mode		Weekly Hours	Distribution of Marks						Total Marks
					Theory			Practical			
		T	P		Int	Fin	Exam Hour	Int	Fin	Exam Hour	
1	English	3	0	3	20	80	3	-	-	-	100
2	Nepali	3	0	3	20	80	3	-	-	-	100
3	Social Studies	2	0	2	10	40	1.5	-	-	-	50
4	Anatomy & Physiology	4	1	5	20	60	3	10	10	3	100
5	Physics	4	2	6	20	60	3	10	10	3	100
6	Chemistry	4	2	6	20	60	3	10	10	3	100
7	Zoology	3	2	5	20	60	3	10	10	3	100
8	Botany	3	2	5	20	60	3	10	10	3	100
9	Mathematics & Statistics	4	1	5	20	60	3	10	10	3	100
	Total	**30**	**10**	**40**	**170**	**560**		**60**	**60**		**850**

Second year

S. N.	Subject	Mode		Weekly Hours	Distribution of Marks						Total Marks
					Theory			Practical			
		T	P		Int	Fin	Time (Hrs)	Internal	Final	Time (Hrs)	
1	Radiographic Technique	4	2	6	20	80	3	20	30	3	150
2	Radiological Procedures	4	2	6	20	80	3	20	30	3	150
3	Radiographic photography	4	1	5	20	80	3	10	15	3	125
4	Radiographic equipment	4	1	5	20	80	3	10	15	3	125
5	Basic Radiation physics	4	1	5	20	80	3	10	15	3	125
6	Radiological Anatomy	2	1	3	10	40	1.5	10	15	3	75
7	Basic Public Health	4	1	5	20	80	3	10	15	3	125
8	First aid/ PHC/MCH	2	1	3	10	40	1.5	10	15	3	75
	Total	**28**	**10**	**38**	**140**	**560**		**100**	**150**		**950**

Third year

S. N.	Subject	Mode		Weekly Hours	Distribution of Marks						Total Marks
					Theory			Practical			
		T	P		Int	Fin	Time (Hrs)	Internal	Final	Time (Hrs)	
1	Basic Radiographic Pathology	2	1	3	10	40	1.5	10	15	3	75
2	Hospital Practice & Patient Care	2	1	3	10	40	1.5	10	15	3	75
3	Radiography Practical I	-	24	24	-	-	-	240	360	6	600
4	Radiography Practical II	-	10	10	-	-	-	100	150	6	250
	Total	**4**	**36**	**40**	**20**	**80**		**360**	**540**		**1000**

*Details on the distribution of marks for Radiography Practical I & II evaluation are mentioned in the respective section of the curriculum.

First Year

See Separate Curriculum for Health Science First Year All

Second Year

Subjects

1. Radiographic technique
2. Radiological Procedures
3. Radiographic photography
4. Radiographic equipment
5. Radiation physics
6. Radiological Anatomy
7. Basic Public Health
8. First aid / PHC / MCH

Radiographic Technique

Total: 234 Hrs	**Total Marks: 150**
Theory: 156 Hrs	**Theory: 100 (Internal: 20 + Final: 80)**
Practical: 78 Hrs	**Practical: 50 (Internal: 20 + Final: 30)**

Course Description:

This course provides knowledge and skills on routine and supplementary radiographic techniques for different parts of the human body. This course deals on performing routine radiographic technique for upper and lower limbs, thoracic cage and abdomen, spine and skull. This course also deals supplementary views for the spine and pelvis, and skull. Additionally, this course also deals with tomography and the registration process.

Course Objectives:

On the completion of the course, the learner will be able to:

1. Describe and perform routine radiographic techniques for upper and lower limbs, thoracic cage and abdomen, spine and skull.
2. Describe and perform supplementary views for the spine and pelvis, and skull.
3. Describe and perform dental radiographic techniques.
4. Learn different tomographic procedures for the chest, kidney, gall bladder and skeletal system
5. Describe and perform registration and identification procedure for patients.

Course Contents:

Unit 1: Introduction to Radiographic Technique	**Theory: 12 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 1.1: Anatomical and radiological terminologies	**Theory: 8 Hrs**	**Lab/Practical: 4 Hrs**

Theory	
Enabling Objectives:	**Content:**
1. Define anatomical position 2. Define different planes with their relation to each other. 3. Recall various important anatomical terminologies. 4. Describe different radiographic positions. 5. Define the radiographic positioning terminology 6. Define projection terminologies.	1. Definition of anatomical position, sagittal plane, coronal plane, axial plane, median sagittal plane, anterior, posterior, dorsal, ventral, supine, prone, erect, medial, lateral, superior, inferior, cranial, caudal, flexion, extension, abduction, adduction, circumduction, rotation, proximal, distal, oblique, decubitus, superficial, deep, palmar, plantar, inversion, and eversion, apical, foramen, condyle, fossa, process, radiographic baseline. 2. Definition of Projection and View, Postero-anterior, antero-posterior, RAO, LAO, RPO, LPO, dorsal decubitus, ventral decubitus, lateral decubitus, OF, OM, SID, SOD, OFD.

Sub-unit 1.2: Radiographic Work Drill	**Theory: 4 Hrs**	**Lab/Practical: 1 Hr**
1. Describe the process of work drill of radiographers. 2. Fill up the request forms. 3. Practice some common medical terms and abbreviations. 4. List the steps of registration of patients. 5. State the importance of a monthly and annual record, filing system 6. Prepare the proforma invoices. 7. Describe process of filing of radiographs and reports	1. Definition of radiographic work drill 2. Significance, purpose and process of patient identification 3. Usage and significance of radiographic request from 4. Practice common medical terms and abbreviations in radiographic request forms 5. Identify patient registration process, and record keeping process, 6. Define patient identification and verification with use of x-ray identification numbers, hospital numbers, patient's name, cross reference bill with patient's name. 7. Define the usage and importance of radiographic examination logbook	
Practical		
Performance Objectives:	**List of Tasks:**	
1. In radiography skill lab, students will able to: 2. Recall basic anatomical terminologies 3. Prepare a chart of work drill of radiographers. 4. Observe different forms used in radiology departments 5. Observe the steps of registration of patients. 6. Observe monthly and annual record, filing system and prepare the proforma invoices. 7. Observe radiographs and reports (x-ray no., hospital number, patient's name, cross reference bill, with patient's name, etc). 8. Practice some abbreviations and common medical terms.	1. Prepare a chart for anatomical terminologies. 2. Prepare a chart of common medical terminologies and abbreviations used in radiography. 3. Prepare chart for radiographic workdrill 4. Design radiographic request forms 5. Design radiographic examination log register. 6. Prepare the proforma invoices	
Evaluation methods: Written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-powerpoint presentations, textbooks. Simulated setting, supervised clinical practice.	

Unit 2: Radiographic Technique for the Extremities	Theory: 50 Hrs	Lab/Practical: 20 Hrs
Sub-unit 2.1: Radiographic Technique for Upper Limb	**Theory: 25 Hrs**	**Lab/Practical: 10 Hrs**

Theory

Enabling Objectives:	Content:
1. Describe radiographic examination process of fingers. 2. Describe radiographic examination process of thumb. 3. Describe radiographic examination process of hand. 4. Describe radiographic examination process of wrist. 5. Describe radiographic examination process of forearm. 6. Describe radiographic examination process of elbow. 7. Describe radiographic examination process of humerus 8. Describe radiographic examination process of shoulder. 9. Describe radiographic examination process of clavicle. 10. Describe radiographic examination process acromio-clavicular joints 11. Describe radiographic examination process sterno-clavicular joints. 12. Describe radiographic examination process of scapula 13. State the purposes of these views.	1. Review anatomy of upper limb , the shoulder joint, its parts and other joints in upper limb 2. Radiographic examination technique for fingers: postero-anterior, lateral (index and middle finger), lateral (ring and little finger) projections. 3. Radiographic examination technique for thumb: lateral, antero-posterior, postero-anterior (in case of foreign body) projections. 4. Radiographic examination technique for hand: dorsi-palmar (postero-anterior), dorsi-palmar oblique, both hands postero-anterior, ball –catcher's view, lateral projections. 5. Radiographic examination technique for wrist: PA, lateral, oblique projections. 6. Radiographic examination technique for scaphoid and carpel tunnel. 7. Radiographic examination technique for forearm: AP and lateral projections. 8. Radiographic examination technique for elbow: Lateral and AP projections. 9. Radiographic examination technique for humerus: shaft, supracondylar fracture, bicipital groove, neck of humerus. 10. Radiographic examination technique for shoulder: basic, outlet, gleno-humoral joint, recurrent dislocations, calcified tendons, acromio-clavicular joints. 11. Radiographic examination technique for clavicle and sterno-clavicular joints. 12. Radiographic examination technique for scapula and coracoid process. Note: Technique described as Indications, Contra-indications, Exposure factors, procedure and image criteria and technical considerations.

Sub-unit 2.2 : Radiographic Technique for Lower Limb	Theory: 25 Hrs	Lab/Practical: 10 Hrs
1. Describe radiographic examination process of toes. 2. Describe radiographic examination process of foot. 3. Describe radiographic examination process of calcaneum. 4. Describe radiographic examination process of ankle. 5. Describe radiographic examination process of tibia. 6. Describe radiographic examination process of fibula. 7. Describe radiographic examination process of knee. 8. Describe radiographic examination process of femur. 9. Describe radiographic examination process of hip joint. 10. Describe radiographic examination process of neck of femur. 11. State the purposes of these views.	1. Review anatomy of the lower limbs and the joints involved. 2. Radiographic examination technique for toes: routine projections and projections for hallux and metatarsal-phalangeal joint. 3. Radiographic examination technique for foot: dorsi-planter and dorsiplanter oblique, lateral, lateral erect, dorsi-planter erect. 4. Radiographic examination technique for foreign body in the foot 5. Radiographic examination technique for calcaneum: lateral and axial projections. 6. Radiographic examination technique for ankle: basic, alternate and stress projections. 7. Basic radiographic examination technique for subtalar joints. 8. Radiographic examination technique for tibia and fibula. (routine projections) 9. Radiographic examination technique for tibial tuberosity. 10. Radiographic examination technique for knee joint: basic, alternate, stress and standing projections. 11. Radiographic examination technique for patella and loose bodies: routine and alternate. 12. Radiographic examination technique for shaft of femur, neck of femur: basic and alternate techniques. 13. Weight bearing projections and its significance 14. Leg alignment projections and its purpose. Note: Technique described as Indications, Contra-indications, Exposure factors, procedure and image criteria and technical considerations.	

Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab with a dummy patient, students will able to: 1. Perform radiography of fingers. 2. Perform radiography of thumb. 3. Perform radiography of hand. 4. Perform radiography of wrist. 5. Perform radiography of forearm. 6. Perform radiography of elbow. 7. Perform radiography of humerus 8. Perform radiography of shoulder. 9. Perform radiography of clavicle. 10. Perform radiography acromio-clavicular joints 11. Perform radiography sterno-clavicular joints. 12. Perform radiography of scapula 13. Perform radiography of toes. 14. Perform radiography of foot. 15. Perform radiography of calcaneum. 16. Perform radiography of ankle. 17. Perform radiography of tibia. 18. Perform radiography of fibula. 19. Perform radiography of knee. 20. Perform radiography of femur. 21. Perform radiography of hip joint. 22. Perform radiography of femur.	**With A Dummy Patient** 1. Practice radiography of fingers. 2. Practice radiography of thumb. 3. Practice radiography of hand. 4. Practice radiography of wrist. 5. Practice radiography of forearm. 6. Practice radiography of elbow. 7. Practice radiography of humerus 8. Practice radiography of shoulder. 9. Practice radiography of clavicle. 10. Practice radiography acromio-clavicular joints 11. Practice radiography sterno-clavicular joints. 12. Practice radiography of scapula 13. Practice radiography of toes. 14. Practice radiography of foot. 15. Practice radiography of calcaneum. 16. Practice radiography of ankle. 17. Practice radiography of tibia. 18. Practice radiography of fibula. 19. Practice radiography of knee. 20. Practice radiography of femur. 21. Practice radiography of hip joint. 22. Practice radiography of femur. 23. Practice radiation protection during the extremity radiography. 24. Observe the images of all projection.
Evaluation methods: Written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-powerpoint presentations, textbooks. Simulated setting, supervised clinical practice.

Unit 3: Radiographic Technique for the Trunk (thoracic cage and abdomen)	Theory: 35 Hrs	Lab/Practical: 11 Hrs
Sub-unit 3.1 : Radiographic Technique for Thoracic cage	**Theory: 25 Hrs**	**Lab/Practical: 6 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe radiographic examination process of chest. 2. Describe radiographic examination process of heart. 3. Describe radiographic examination process of ribs. 4. Describe radiographic examination process of sternum. 5. State the purposes of these views	1. Review anatomy of the thoracic cage and bones involved. 2. Routine radiography of pharynx and larynx. 3. Radiography of the trachea including the thoracic inlet 4. Radiographic examination technique for lungs : routine and alternate projections 5. Radiographic examination technique for heart: routine and alternate projections 6. Radiographic examination technique for ribs : routine and alternate projections 7. Radiographic examination technique for and sternum apical views, lordotic view & decubitus view, oblique views for heart size & lateral view with barium swallow, thoracic inlet, diaphragm excursion, inhaled or swallowed foreign body. Note: Technique described as Indications, Contra-indications, exposure factors, procedure and image criteria and technical considerations.	
Sub-unit 3.2 : Radiographic Technique for Abdomen	**Theory: 10 Hrs**	**Lab/Practical: 5 Hrs**
1. Describe routine radiographic examination process of abdomen. 2. Describe the supplementary radiographic examinations of abdomen. 3. Describe radiographic technique of incase of acute abdomen. 4. State the need for these x-rays 5. State the purposes of these views	1. Review gross anatomy of the abdomen, body habitus, ten days rule, nine regions of abdomen. 2. Radiographic examination technique for basic and supplementary views of abdomen. 3. Radiographic examination technique for acute abdomen, foreign body, decubitus view, the diaphragmatic perforation and imperforate anus. Note : Technique described as Indications, Contra-indications, Exposure factors, procedure and image criteria and technical considerations	

Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab with a dummy patient , students will able to: 1. Perform routine chest x-ray examination. 2. Perform alternative chest x-ray examination. 3. Perform routine abdomen x-ray examination. 4. Perform abdomen x-ray on emergency/acute conditions.	With A Dummy Patient: 1. Practice radiography of chest (basic and alternate). 2. Practice radiography of abdomen (basic and alternate). 3. Practice radiography in decubitus projection of abdomen. 4. Practice radiation protection during the chest and abdomen radiography. 5. Observe the images of all projection.
Evaluation methods: Written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-powerpoint presentations, textbooks. Simulated setting, supervised clinical practice.

Unit 4: Radiographic technique for the Spine and Pelvic cavity	**Theory: 30 Hrs**	**Lab/Practical: 20 Hrs**
Sub-unit 4.1: Radiographic Techniques for the spine	**Theory: 15 Hrs**	**Lab/Practical: 10 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe radiographic examination process of cervical spine. 2. Describe radiographic examination process of thoracic spine. 3. Describe radiographic examination process of lumbar spine. 4. Describe radiographic examination process of sacrum and coccyx. 5. State the purposes of these views.	1. Review gross anatomy of the spine, the natural curve of spine and its parts. 2. Routine and alternate radiographic examination technique for cervical spine 3. Routine radiographic examination technique for cervio-thoracic junction. 4. Routine and alternate radiographic examination technique for thoracic spine, 5. Routine and alternate radiographic examination technique for lumbar spine 6. Routine radiographic examination technique for lumbo-sacral junction. 7. Routine and alternate radiographic examination technique for sacrum and coccyx, 8. Explain the supplementary views for neck, odontoid peg (open-mouth), vertebral foramina of cervical spine, upper thoracic spine, oblique lumbar	

	spine, lumbo-sacral junction, oblique sacro-iliac joints, ilium, acetabulum, pelvimetry and skeletal survey. Note: Technique described as Indictions, Contra-indications, Exposure factors, procedure and image criteria and technical considerations.
Sub-unit 4.2 : Radiographic Techniques for the Pelvis	**Theory: 15 Hrs** **Lab/Practical: 10 Hrs**
1. Describe radiographic examination process of pelvis. 2. Describe radiographic examination process of hip joints. 3. Describe radiographic examination process of sacro-iliac joints. 4. Describe radiographic examination process of ilium. 5. Describe radiographic examination process of acetabulum. 6. Describe the process of pelvimetry. 7. Describe radiographic examination process of skeletal survey. 8. State the purposes of these views.	1. Review gross anatomy of the pelvis and pelvic cavity. 2. Routine and alternate radiographic examination technique for bilateral hip joints (pelvis including femur.) 3. Routine and alternate radiographic examination technique for hip joints and acetabulum. 4. Routine and alternate radiographic examination technique for ilium, symphyis pubis. 5. Routine and alternate radiographic examination technique for sacro-iliac joints Note : Technique described as Indications, Contra-indications, Exposure factors, procedure and image criteria and technical considerations.
Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab with a dummy patient , students will able to: 1. Perform radiography of spines. 2. Perform radiography of spinal junctions. 3. Perform radiography of pelvis. 4. Perform radiography of sacro-iliac joints. 5. Perform pelvimetry.	With A Dummy Patient: 1. Practice spine examination. 2. Practice routine radiography of cervical spine. 3. Practice routine radiography of thoracic spine. 4. Practice routine radiography of lumbar spine. 5. Practice routine radiography of sacrum and coccyx. 6. Practice Swimmer's lateral projection. 7. Practice radiography of pelvis (basic and alternate). 8. Practice the radiography of sacro-iliac

	joints. 9. Practice radiography of hip joints. 10. Practice pelvimetry. 11. Practice radiation protection measures during pelvic radiographic examination. 12. Practice radiation protection during spinal radiographic examination. 13. Observe the images of all projection.	
Evaluation methods: Written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-powerpoint presentations, textbooks. Simulated setting, supervised clinical practice.	
Unit 5: Radiographic technique for the Skull	**Theory: 22 Hrs**	**Lab/Practical: 20 Hrs**
Sub-unit 5.1: Routine techniques for the Skull	**Theory: 12 Hrs**	**Lab/Practical: 10 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define radiographic anatomical landmarks of the skull. 2. Describe radiographic examination process of cranial bones. 3. Describe radiographic examination process of cranial facial bones. 4. Describe radiographic examination process of cranial mandible. 5. State the purposes of these views.	1. Review gross anatomy of the skull, the landmarks of skull, cranium, cranial bones, and facial bones and enlist them. 2. Technique for basic/routine views of bones of skull including cranium, face and mandible 3. Practice all the possible views on a dummy patient. Note : Technique described as Inductions, Contra-indications, Exposure factors, procedure and image criteria and technical considerations.	
Sub-unit 5.2 : Supplementary views for the Skull	**Theory: 10 Hrs**	**Lab/Practical: 10 Hrs**
1. Describe radiographic examination process for town's view. 2. Describe radiographic examination process of submento vertical projection. 3. Describe radiographic examination process of sella turcica. 4. Describe radiographic examination process of temporo-mandibular joint. 5. Describe radiographic examination process of nasal bones. 6. Describe radiographic examination process of paranasal sinuses. 7. Describe radiographic examination process of mastoids. 8. Describe radiographic examination process of orbits.	1. Radiography technique for Town's projection 2. Radiography technique for submento vertical projection. 3. Radiography technique for sella turcica, 4. Radiography technique temporo-mandibular joint, 5. Radiography technique nasal bones, 6. Radiography technique paranasal sinuses, 7. Radiography technique mastoids 8. Radiography technique or bitsa and optic	

9. Describe radiographic examination process of optic foramina. 10. Describe radiographic examination process of foreign body in the eye. 11. State the purposes of these views.	foramina, 9. Radiography technique foreign body in the eye, Note : Technique described as indications, Contra-indication, Exposure factors, procedure and image criteria and technical considerations.
Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab with a dummy patient , students will able to: 1. Perform routine skull x-ray examination. 2. Perform alternative skull x-ray examination. 3. Perform skull x-ray in case of trauma.	With A Dummy Patient: 1. Practice basic radiography of skull (basic and alternate). 2. Practice radiation protection during the skull radiography. 3. Observe the images of all projection.
Evaluation methods: Written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-powerpoint presentations, textbooks. Simulated setting, supervised clinical practice.
Unit 6: Miscellaneous Radiographic Techniques	**Theory: 7 Hrs** / **Lab/Practical: 2 Hrs**
Sub-unit 6.1 : Dental Radiography and tomography	**Theory: 7 Hrs** / **Lab/Practical: 2 Hrs**
Theory	
Enabling Objectives:	**Content:**
1. Define dental radiography. 2. Describe radiographic examination process of intra-oral dental radiography 3. Describe radiographic examination process of extra-oral dental radiography. 4. Define the basic principle of tomogram. 5. Enlist practical application of tomography for the chest, kidney, gall bladder and skeletal system. 6. Explain soft tissue radiography. 7. Explain high kVp technique. 2. State the purposes of these views.	1. Definition of dental radiography. 2. Definition and technique of intra-oral dental radiography. 3. Definition and technique of extra-oral dental radiography. 4. Definition of tomography, tomographic principles and tomographic planes. 5. Basic outline of tomography, the movements involved its usage in chest, kidney, gall bladder and skeletal system. 6. Technique for tomography of views of bones of chest, kidney, gall bladder and skeletal system, dental radiography 7. Definition of Soft tissue radiography and its purpose. 8. Definition of high kVp technique and its purpose.

	Note : Technique described as Indications, Contra-indications, Exposure factors, procedure and image criteria and technical considerations.
Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab with a dummy patient , students will able to: 1. Perform routine dental x-ray examination. 2. Perform soft tissue x-ray examination. 3. Perform x-ray examination with high kVp technique.	With A Dummy Patient: 1. Identify the dentition and teeth with dental formula. 2. Identify the process of dental. 3. Practice dental radiography. 4. Practice radiation protection during the dental radiography. 5. Observe the dental x-ray machine. 6. Practice radiation protection during the soft tissue radiography. 7. Practice radiation protection during the high kVp technique.
Evaluation methods: Written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-powerpoint presentations, textbooks. Simulated setting, supervised clinical practice.

Text Books: Using APA Format

1. *A. S.Whitley, Charles Sloane, Graham Hoadley, Adrian Moore, Craig Anderson, Ken Holmes (2016) -**Clark's Positioning in Radiography (13 Ed.)**.UK, Oxford University Press: CRC Press.*
2. *Philip W. Ballinger, Eugene D. Frank (2003)- **Merrill's Atlas of Radiographic Positions & Radiologic Procedures, Vol. I & II**. Mosby. (Latest edition)*
3. *Jeannean Hall Rollins, Barbara J. Smith(2015)-**Merrill's Atlas of Radiographic Positioning and Procedures(2015): 3-Volume Set** Elsevier Health Sciences.(Latest edition)*
4. *T. Holm. PES. Palmer(1896)-**Manual of Radiographic Technique** WHO Press*
5. *Bhargava Satish K.-**Text Book Of Radiology Technicians**- CBS Publishers & Distributors – Latest edition*

Radiological Procedures

Total: 234 Hrs	**Total Marks: 150**
Theory: 156 Hrs	**Theory: 100 (Internal: 20 + Final: 80)**
Practical: 78 Hrs	**Practical: 50 (Internal: 20 + Final: 30)**

Course Description:

This course provides knowledge and skills on specialised radiographic techniques. This course deals on radiographic investigation of different body systems using contrast media**.** This course deals with special radiological procedures. Additionally, this course also describes about mammography, portable and mobile X-ray examinations.

Course Objectives:

On the completion of the course, the learner will be able to:

- Understand about contrast media and their adverse effects.
- Perform and assist special radiographic procedures with the use of contrast media for examination of the uro-genital system.
- Perform and assist special radiographic procedures with the use of contrast media for examination of the Digestive system.
- Perform routine and special mammographic examination.
- Assist special radiographic procedures with the use of contrast media for examination of the Vascular and lymphatic system.
- Assist special radiographic procedures with the use of contrast media for examination of the Neurological system.
- Handle portable and mobile machine for ward and theatre radiography.

Course Contents:

Unit 1: Contrast Media	**Theory: 17 Hrs**	**Lab/Practical: 7 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define contrast media. List historical aspect of contrast media 2. Discuss the type of contrast media 3. Discuss the method of introducing of route of contrast media 4. Discuss the adverse effects of contrast media. Predisposing factor for reaction 5. Discuss the management of reaction 6. Discuss the emergency medicine and emergency equipment used in radiology	1. Definition of contrast media 2. Contrast media history 3. Types of contrast media - Positive and negative contrast media - Ionic and non-ionic contrast media - List the example of contrast media 4. Different routes like- IV, IM, IA, IT, per oral and per rectum. 5. Common symptoms and management of different reaction - Minor reaction - Moderate reaction - Major reaction 6. Emergency drugs and equipment.	

Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Identify the types of contrast media. 2. Observe and perform methods of introducing the contrast media. 3. Make a chart to manage reactions of contrast media. 4. Observe and make a list of the emergency equipment and drugs needed to cope with reactions.	1. Identification the types of contrast media. 2. Observation and performing methods of introducing the contrast media. 3. List a chart to manage reactions of contrast media. 4. List of the emergency equipment and drugs needed to cope with reactions.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.1: Barium Swallow	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	Content:	
1. Define Barium swallow 2. Describe about Barium Swallow examination. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Barium swallow 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Barium swallow with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.2: Barium Meal	**Theory: 5 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Barium meal 2. Describe about Barium meal. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Barium meal 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Barium meal with filming 4. List the Complications and After care	

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.3: Barium Follow Through	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	Content:	
1. Define Barium Follow Through 2. Describe about Barium Follow Through examination. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Barium Follow Through 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Barium Follow Through with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.4: Hypotonic Duodenography	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Hypotonic Duodenography 2. Describe about Hypotonic Duodenography examination. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Hypotonic Duodenography 2. Mention the Procedure with filming 3. List the Advantage of Hypotonic Duodenography over Barium meal 4. Complications of above procedure.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.5: Small Bowel Enema/ Enteroclysis	**Theory: 5 Hrs**	**Lab/Practical: 4 Hrs**
Theory		
Enabling Objectives:	Content:	
1. Define Small Bowel Enema 2. Describe about Small Bowel Enema examination. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Small Bowel Enema 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique	

	for Small Bowel Enema with filming 4. List the Complications and After care 5. List the different between of Enteroclysis and Barium Follow Through	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.6: Barium Enema	**Theory: 4 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Barium Enema 2. Describe about Barium Enema Examination. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Barium Enema 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Barium Enema with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.7: Loopogram	**Theory: 1 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	Content:	
1. Define Loopogram 2. Discuss about procedure of Loopogram	1. Definition of Loopogram 2. Description of the Procedure with filming 3. List the Complications	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	

Unit 2: Radiographic investigation of gastro-intestinal tract using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 18 Hrs**
Sub-unit 2.8: Gastrograffin Examination	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Gastrographic study 2. Mention about Contrast used for examination 3. Discuss the Procedure	1. Definition of Gastrographic examination 2. List the contrast used for this examination- Gastrograffin 3. Description of the Procedure with filming 4. Advantage and disadvantage	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Practical		
Performance objective:	**List of Tasks:**	
In radiography skill lab, students will able to: Observe the radiological procedures related to Gastrointestinal Tract using Contrast Media. .	Observation of 1. Barium Swallow. 2. Barium Meal. 3. Barium Follow through. 4. Hypotonic duodenography. 5. Ba-enema. 6. Small bowel enema. 7. Loopogram. 8. Gastrographic examination of Gl tract **9.** Various X-ray images of the procedure	
Evaluation methods: viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Lab-room instruction, practice in a simulated setting, supervised clinical practice	
Unit 3: Radiographic investigation of Urogenital system sign contrast media	**Theory: 25 Hrs**	**Lab/Practical: 11 Hrs**
Sub-unit 3.1: Intravenous Urography (IVU)	**Theory: 7 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Intravenous Urography 2. Describe about IVU examination. 3. Discuss about RFT report in IVU 4. State the role in radiation protection during Fluoroscopy	1. Definition of Intravenous Urography 2. List the - Indications - Contraindications - Equipment used - Contrast media - Normal value of RFT 3. Discussion about Procedure/technique for Intravenous Urography with filming 4. List the Complications and After care	

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 3: Radiographic investigation of Urogenital system using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 11 Hrs**
Sub-unit 3.2: Cystogram	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Cystogram 2. Discuss about procedure of Cystogram	1. Definition Cystogram 2. Mention the Procedure with filming Complications	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 3: Radiographic investigation of Urogenital system using contrast media	**Theory: 25 Hrs**	**Lab/Practical:11 Hrs**
Sub-unit 3.3: Retrograde Urethrogram (RGU)	**Theory: 4 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define RGU 2. Describe about the RGU Procedure 3. State the role in radiation protection during Fluoroscopy	1. Definition of Retrograde Urethrography 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for RGU with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 3: Radiographic investigation of Urogenital System using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 11 Hrs**
Sub-unit 3.4: Micturating Cystourethrography (MCU)	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define MCU 2. Describe about MCU Procedure 3. State the role in radiation protection during Fluoroscopy	1. Definition of Micturating Cystourethrography 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique	

	for MCU with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 3: Radiographic investigation of Urogenital System using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 11 Hrs**
Sub-unit 3.5: Retrograde Pyelogram (RGP)	**Theory :3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define RGP 2. Describe about RGP procedure 3. State the role in radiation protection during Fluoroscopy	1. Definition of Retrograde Pyelogram 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for RGP with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 3: Radiographic investigation of Urogenital System using contrast media	**Theory: 25 Hrs**	**Lab/Practical: 11 Hrs**
Sub-unit 3.6: Hysterosalpingography (HSG)	**Theory: 5 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define HSG 2. Describe about HSG Procedure. 3. State the role in radiation protection during Fluoroscopy	1. Definition of Hysterosalpingography 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for HSG with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Practical		
Performance Objective:	**List of Tasks:**	
In radiography skill lab, students will able to observe:	Observation of following Procedure: 1. Intravenous Urogram (IVU).	

The different radiological procedure related to Urogenital System by using Contrast media.	2. Cystogram. 3. Micturating cystogram. 4. Urethrogram. 5. Retrograde pyelogram. 6. Hysterosalpingogram (HSG) 7. Observe the various X-ray images of above procedures.	
Evaluation methods: viva Exam, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Lab room instruction, practice in a simulated setting, supervised clinical practice	
Unit 4: Radiographic investigation of Biliary System using contrast media	**Theory: 20 Hrs**	**Lab/Practical: 8 Hrs**
Sub-unit 4.1: Oral Cholecystography and Intravenous Cholecystography	**Theory: 3 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Describe about Oral Cholecystography and Intravenous Cholecystography procedure.	1. Definition of Oral Cholecystography & Intravenous Cholecystography 2. List the Contrast media used 3. Mention about Procedure/technique for OCG & Intravenous Cholangiography 4. Limitation of Procedure	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 4: Radiographic investigation of Biliary System using contrast media	**Theory: 20 Hrs**	**Lab/Practical: 8 Hrs**
Sub-unit 4.2: Percutaneous Transhepatic Cholangiogram and Drainage (PTCD)	**Theory: 5 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define about PTCD 2. Describe about PTCD Procedure 3. State the role in radiation protection during Fluoroscopy	1. Definition of PTCD 2. List the - Indications - Contraindications - Equipment used - Contrast media - Bleeding Parameter 3. Discussion about Procedure/technique for PTCD with filming 4. List the Complications and After care	

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice

Unit 4: Radiographic investigation of Biliary System using contrast media	**Theory :20 Hrs**	**Lab/Practical: 8 Hrs**
Sub-unit 4.3: Endoscopic Retrograde Cholagio-Pancreatography (ERCP)	**Theory: 5 Hrs**	**Lab/Practical: 2 Hrs**

Theory	
Enabling Objectives:	**Content:**
1. Define ERCP 2. Describe about ERCP procedure. 3. State the role in radiation protection during Fluoroscopy	1. Definition of ERCP 2. List the - Indications - Contraindications - Equipment used - Contrast media - Bleeding Parameter 3. Discussion about Procedure/technique for ERCP with filming 4. List the Complications and After care 5. Mention about Therapeutic use of ERCP
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice

Unit 4: Radiographic investigation of Biliary System using contrast media	**Theory: 20 Hrs**	**Lab/Practical: 8 Hrs**
Sub-unit 4.4: Intra-operative Cholangiography (IOC)	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**

Theory	
Enabling Objectives:	**Content:**
1. Define Intra-Operative Cholangiography 2. Describe about Intra-Operative Cholangiography procedure 3. State the role in radiation protection during Fluoroscopy in OT	1. Definition of Intra-Operative Cholangiography 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Intra-Operative Cholangiography with filming 4. List the Complications and After care
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice

Unit 4: Radiographic investigation of Biliary System using contrast media	**Theory: 20 Hrs**	**Lab/Practical: 8 Hrs**
Sub-unit 4.5: T-Tube Cholangiography	**Theory: 3 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define T-Tube Cholangiography 2. Describe about T-Tube Cholangiography 3. State the role in radiation protection during Fluoroscopy.	1. Definition of T-Tube Cholangiography 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for T-Tube Cholangiography with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Practical		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, students will able to observe: The different radiological procedure related to Biliary System by using Contrast media.	Observation of following Procedure: - Percutaneous transhepatic cholangiography and drainage (PTC and PTCD) - Endoscopic retrograde cholangio pancreatography (ERCP). - IOC & T-Tube Cholangiogram - Observe the various X-ray images of above procedures.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 5: Radiographic investigation of Vascular System using contrast media	**Theory: 27 Hrs**	**Lab/Practical:12 Hrs**
Sub-unit 5.1: Angiography	**Theory: 6 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Angiography 2. Describe Catheterization Methods for Angiography	1. Definition of Angiography 2. List the Contrast media used 3. List the equipment used 4. List the Patient Preparation for Angiography 5. Discussion of Seldinger's Technique 6. Complications of Angiography	

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 5: Radiographic investigation of Vascular System using contrast media	**Theory: 27 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 5.2: Carotid Angiogram	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Carotid Angiogram 2. Describe about Carotid Angiogram 3. State the role in radiation protection during Fluoroscopy.	1. Definition of Carotid Angiogram 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Description about Procedure/technique for Carotid Angiogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 5: Radiographic investigation of Vascular System using contrast media	**Theory: 27 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 5.3: Vertebral Angiogram	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Vertebral Angiogram 2. Describe about Vertebral Angiogram 3. State the role in radiation protection during Fluoroscopy.	1. Definition of Vertebral Angiogram 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Description about Procedure/technique for Vertebral Angiogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	

Unit 5: Radiographic investigation of Vascular System using contrast media	**Theory: 27 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 5.4: Aortogram	**Theory: 5 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Aortogram 2. Describe Aortogram examination	1. Definition of Aortogram 2. List the	

3. State the role in radiation protection during Fluoroscopy.	- Indications - Contraindications - Equipment - Contrast media 3. Description about Procedure/technique for Aortogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 5: Radiographic investigation of Vascular System using contrast media	**Theory: 27 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 5.5: Peripheral Angiogram	**Theory: 6 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Peripheral Angiogram 2. Define Femoral Angiogram 3. Describe about Femoral Angiogram 4. State the role in radiation protection during Fluoroscopy.	1. Definition of Femoral Angiogram 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Femoral Angiogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 5: Radiographic investigation of Vascular System using contrast media	**Theory: 27 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 5.6: Venography/Phlebography	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Venography 2. Describe about Venography Examination 3. State the role in radiation protection during Fluoroscopy.	1. Definition of Venography 2. List the - Indications - Contraindications - Equipment - Contrast media 3. Discussion about Procedure/technique for Venography with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	

<table>
<tr><th colspan="3">Practical</th></tr>
<tr><td>Performance Objective:</td><td colspan="2">List of Tasks</td></tr>
<tr><td>In radiography skill lab, students will able to observe: The different radiological procedure related to Vascular System by using Contrast media.</td><td colspan="2">Observe the following examination:
1. Carotid Angiogram
2. Aortogram
3. Peripheral Angiogram
4. Venogram</td></tr>
<tr><td>Evaluation methods: viva, performance observation in clinical setting</td><td colspan="2">Teaching / Learning Activities / Resources: classroom instruction, practice in a simulated setting, supervised clinical practice</td></tr>
<tr><td>Unit 6: Other Radiographic investigation using contrast media</td><td>Theory: 23 Hrs</td><td>Lab/Practical: 12 Hrs</td></tr>
<tr><td>Sub-unit 6.1: Myelogram</td><td>Theory: 5 Hrs</td><td>Lab/Practical: 1 Hr</td></tr>
<tr><td colspan="3">Theory</td></tr>
<tr><td>Enabling Objectives:</td><td colspan="2">Content:</td></tr>
<tr><td>1. Define Myelogram
2. Describe about Myelogram Procedure
3. State the role in radiation protection during Fluoroscopy.</td><td colspan="2">1. Definition of Myelogram- Cervical, Dorsal and Lumber.
2. List the
- Indications
- Contraindications
- Equipment used
- Contrast media
3. Description about Procedure/technique for Myelogram with filming
4. List the Complications and After care</td></tr>
<tr><td>Evaluation methods: written exam, viva, performance observation in clinical setting</td><td colspan="2">Teaching / Learning Activities / Resources: classroom instruction, practice in a simulated setting, supervised clinical practice</td></tr>
<tr><td>Unit 6: Other Radiographic investigation using contrast media</td><td>Theory: 23 Hrs</td><td>Lab/Practical: 12 Hrs</td></tr>
<tr><td>Sub-unit 6.2: Arthrography</td><td>Theory: 2 Hr</td><td>Lab/Practical: 1 Hr</td></tr>
<tr><td colspan="3">Theory</td></tr>
<tr><td>Enabling Objectives:</td><td colspan="2">Content:</td></tr>
<tr><td>1. Define Arthrography
2. Describe about Arthrography Procedure
3. State the role in radiation protection during Fluoroscopy.</td><td colspan="2">1. Definition of Arthrography – Shoulder and Knee
2. List the
- Indications
- Contraindications
- Equipment used
- Contrast media
3. Discussion about Procedure/technique for Arthrography with filming
4. List the Complications and After care</td></tr>
</table>

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.3: Bronchogram	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Bronchogram 2. Describe about Bronchogram procedure 3. State the role in radiation protection during Fluoroscopy.	1. Definition of Bronchogram 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Bronchogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.4: Sailogram	**Theory: 2 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Sailogram 2. Describe about Sailogram procedure 3. State the role in radiation protection during Fluoroscopy.	1. Definition of Sailogram 2. List the - Indications - Contraindications - Equipment used - Contrast media 3. Discussion about Procedure/technique for Sailogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.5: Dacryo-cystography (DCG)	**Theory: 2 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Dacryo-cystogram 2. Describe about Dacryo-cystogram examination.	1. Define Dacryo-cystogram 2. List the - Indications	

3. State the role in radiation protection during Fluoroscopy.	- Contraindications - Equipment - Contrast media 3. Discussion about Procedure/technique for Dacryo-cystogram with filming 4. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.6: Sinogram / Fistulogram	**Theory: 3 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Sinogram/Fistulogram 2. Describe about Sinogram/Fistulogram 3. State the role in radiation protection during Fluoroscopy.	1. Definition of Sinogram/Fistulogram 2. Different between Sinus and Fistula 3. List the - Indications - Contraindications - Equipment used - Contrast media 4. Discussion about Procedure/technique for Sinogram with filming 5. List the Complications and After care	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.7: Mammogram	**Theory: 5 Hrs**	**Lab/Practical: 3 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Mammogram 2. Describe about Mammogram Procedure 3. List the role in radiation protection during Mammogram. 4. Define Ductogram in brief.	1. Definition of Mammogram 2. List the Indications and Contraindications 3. Mention of Basic and Supplementary view 4. Description of positioning for CC, MLO & Lateral View. 5. Discussion about Ductogram.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	

Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hr**
Sub-unit 6.8: Macro-Radiography	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Macro-Radiography 2. Write indications For Macro-radiography 3. Mention about equipment and Technique for Macro-radiography.	1. Definition of Macro-Radiography 2. List the Indications for Macro-Radiography 3. Describe Positioning and Technique for this. 4. List advantage and disadvantage of Macro-radiography	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.9: Soft tissue Radiography	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Soft Tissue Radiography 2. Write indications For Soft Tissue Radiography 3. Mention about equipment and Technique 4. Describe clinical use of Soft Tissue Radiography	1. Definition of Soft Tissue Radiography 2. List the different radiographic examination for soft Tissue. 3. Discussion of Positioning and exposure technique for this. 4. List advantage and disadvantage of Soft Tissue Radiography	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	
Unit 6: Other Radiographic investigation using contrast media	**Theory: 23 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 6.10: High kV Technique	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define High kV Technique 2. Write indications For High kV Technique 3. Mention about equipment, Exposure Parameter and clinical use of High kV Technique	1. Definition of High kV Technique 2. List the different radiographic examination for High kV Technique. 3. Describe Positioning and exposure technique for this. 4. List advantage and disadvantage of High kV Technique	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice	

<table>
<tr><td colspan="3">Practical</td></tr>
<tr><td>Performance objective:</td><td colspan="2">List of Tasks</td></tr>
<tr><td>In radiography skill lab, students will able to observe:
-The different radiological procedure by using Contrast media.
-Different Modified Technique.</td><td colspan="2">Observation of following Examination:
1. Myelogram
2. Sailogram
3. Sinogram
4. Mammogram
5. High kV and Soft tissue Technique
6. Observe the various X-ray images of above procedures.</td></tr>
<tr><td>Evaluation methods: viva, performance observation in clinical setting</td><td colspan="2">Teaching / Learning Activities / Resources: classroom instruction, practice in a simulated setting, supervised clinical practice</td></tr>
<tr><td>Unit 7: Ward & Theatre Radiography</td><td>Theory: 19 Hrs</td><td>Lab/Practical: 10 Hrs</td></tr>
<tr><td>Sub-unit 7.1: Ward Radiography</td><td>Theory: 12 Hrs</td><td>Lab/Practical: 6 Hrs</td></tr>
<tr><td colspan="3">Theory</td></tr>
<tr><td>Enabling Objectives:</td><td colspan="2">Content:</td></tr>
<tr><td>1. Define Ward Radiography & Discuss indications Ward Radiography
2. Describe about Portable and Mobile X-ray Machine
3. Discuss about Accessory Equipment, Infection control and Radiation Protection
4. Discuss about different Technique for Ward Radiography</td><td colspan="2">1. Definition of Ward Radiography
2. List the different radiographic examination for Ward Radiography.
3. Description the Positioning for Chest, Abdomen, Cervical spine, Pelvis, Femur and Neonatal x-ray
4. Radiation Protection during ward Radiography</td></tr>
<tr><td>Evaluation methods: written exam, viva, performance observation in clinical setting</td><td colspan="2">Teaching / Learning Activities / Resources: classroom instruction, practice in a simulated setting, supervised clinical practice</td></tr>
<tr><td>Unit 7: Ward & Theatre Radiography</td><td>Theory: 19 Hrs</td><td>Lab/Practical: 10 Hrs</td></tr>
<tr><td>Sub-unit 7.2: Theatre Radiography</td><td>Theory: 7 Hrs</td><td>Lab/Practical: 4 Hrs</td></tr>
<tr><td colspan="3">Theory</td></tr>
<tr><td>Enabling Objectives:</td><td colspan="2">Content:</td></tr>
<tr><td>1. Define Theatre Radiography & Discuss indications Theatre Radiography
2. Describe about Mobile X-ray Machine used in OT.
3. Discuss about Accessory Equipment, Infection control and Radiation Protection
4. Discuss about different Technique for Hip Pinning and Operative Cholangiography</td><td colspan="2">1. Definition of Theatre Radiography
2. List the different radiographic examination for Theatre Radiography.
3. Description the Positioning, Technique and filming for Hip Pinning and Operative Cholangiography
4. Radiation Protection during Theatre Radiography</td></tr>
<tr><td>Evaluation methods: written exam, viva, performance observation in clinical setting</td><td colspan="2">Teaching / Learning Activities / Resources: classroom instruction, practice in a simulated setting, supervised clinical practice</td></tr>
</table>

Practical	
Performance Objective:	**List of Tasks**
In Ward and Operation Theatre, student should observe Radiography Technique	Observe the Technique for following Procedure: 1. Ward Radiography 2. Theatre Radiography
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** classroom instruction, practice in a simulated setting, supervised clinical practice

Reference Books: Use APA Format

- *A guide to radiological procedure -Stephen Chapman and Richard Nakielny, Fifth edition.*
- *Radiographic Photography & Technique II- Niranjan Thapa; Heritage Publication; 2016*
- *Merill's Atlas of Radiographic Positioning and Diagnostic Procedure, Volume I & II – Philip W Ballinge,*
- *Manual of Radiographic Technique - T. Holm. PES. Palmer,*
- *Text book of Radiology technicians - Satish K. Bhargava*

Radiographic Photography

Total Hours: 195	**Total Marks: 125**
Theory: 156 Hrs	**Theory: 100 (Internal: 20 + Final: 80)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course provides knowledge and skills on photographic process involved in producing a radiograph. This course deals with radiographic films, cassette, intensifying screens, film processing, and digital image receptors. This course also deals with storage of radiographic materials as well as dark room for preparing radiographic images.

Course Objectives:

On the completion of the course, the learner will be able to:

1. Describe photosensitive materials and image characteristics.
2. Explain about image recording system.
3. Describe digital image receptors.
4. Design the darkroom for manual and automatic film processing.
5. Explain about manual and automatic film processor and other darkroom equipment.
6. Perform manual and automatic film processing.
7. Recognize the common film atrifacts and their remedies.
8. Use and understand patient identification on radiograph.

Course Contents:

Unit 1: Introduction of Photography and photosensitive materials	**Theory: 5 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define photography. 2. Define photosensitive materials with examples. 3. List some photosensitive materials with their applications. 4. Define photographic emulsion. 5. Define gelatin.	1. Definition of photography. 2. Definition of photosensitive materials with examples and their applications. 3. Definition of emulsion. 4. Properties of gelatin.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** classroom instruction and observation	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Recognize radiosensitive and photosensitive materials. 2. Practice proper sequence for handling radiosensitive and photosensitive materials	1. Recognize radiosensitive and photosensitive materials. 2. Practice proper sequence for handling radiosensitive and photosensitive materials	

Unit 2: Image Receptor for Conventional Radiography	**Theory: 40 Hrs**	**Practical: 9 Hrs**
Sub-unit 2.1: X-ray film	**Theory: 15 Hrs**	**Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**	
1. Define x-ray film 2. Explain construction of different types of x-ray film. 3. List characteristics features of film base material used for x-ray film. 4. Describe types of x-ray film used in imaging. 5. Define spectral sensitivity. 6. Describe types of x-ray film on the basis of spectral sensitivity.	1. Definition of x-ray film 2. Construction of different types of x-ray film. 3. Characteristics features of film base material for x-ray film. 4. Classification of x-ray film used in imaging. 5. Definition of spectral sensitivity. 6. Classification of x-ray film on the basis of spectral sensitivity.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction and demonstration.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: -practice proper sequence for x-ray film handling.	1. Practice proper sequence for x-ray film handling. 2. Loading of unexposed film. 3. Unloading of exposed film.	
Sub-unit 2.2: Intensifying screen	**Theory: 15 Hrs**	**Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**	
1. Define Luminescence - Fluorescence and Phosphorescence. 2. Define intensifying screen. 3. Describe construction of intensifying screens. 4. List function of intensifying screen. 5. Describe the importance of choice of fluorescent materials for intensifying screen. 6. Compare calcium tungstate with rare earth phosphors 7. Describe the features of phosphor material that govern the speeds. 8. Describe the features of phosphor material that govern sharpness of intensifying screen. 9. Describe the process of mounting of intensifying screens. 10. Describe the process of cleaning of intensifying screens. 11. Describe the test for film screen contact test. **12.** Describe care and maintenance for intensifying screen.	1. Definition of the terms: Luminescence, Fluorescence and Phosphorescence. 2. Definition of intensifying screen. 3. Construction of intensifying screens. 4. Function of intensifying screen. 5. Importance of choice of fluorescent materials for intensifying screen. 6. Calcium tungstate Vs Rare earth phosphor 7. Features of phosphor material that governs the speeds. 8. Features of phosphor material that governs sharpness of intensifying screen. 9. Process of mounting of intensifying screens. 10. Process of cleaning of intensifying screens. 11. Film screen contact test. 12. Care and maintenance for intensifying screen.	

Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction, demonstration.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Identify intensifying screens. 2. Perform cleaning of intensifying screens, 3. Perform mounting of intensifying screens in x-ray cassette.	-Identify intensifying screens. 1. Perform cleaning of intensifying screens, 2. Perform mounting of intensifying screens in x-ray cassette.	
Sub-unit 2.3: Radiographic cassette	**Theory: 10 Hrs**	**Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**	
1. Define radiographic cassette. 2. Describe construction of radiographic cassette. 3. List function of radiographic cassette. 4. Describe different types of radiographic cassette. 5. Describe care and maintenance for radiographic cassette. 6. Describe the process of cleaning of radiographic cassette.	1. Definition of radiographic cassette. 2. Construction of radiographic cassette. 3. Function of radiographic cassette. 4. Different types of radiographic cassette. 5. Process of cleaning of radiographic cassette. 6. Care and maintenance for radiographic cassette. 7. Process of cleaning of radiographic cassette.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** classroom instruction and observation	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Recognize different parts of radiographic cassette. 2. Recognize different types of cassette. **3.** Clean cassette.	1. Recognize different parts of radiographic cassette. 2. Recognize different types of cassette. 3. Clean cassette.	
Unit 3: Radiographic image formation	**Theory: 11 Hrs**	**Practical : 2 Hr**
Sub-unit 3.1: Radiographic image	**Theory: 8 Hrs**	**Lab/Practical: 1 Hr**
Enabling Objectives:	**Content:**	
1. Define radiographic image 2. Explain components of the radiographic image. 3. Explain factors affecting image quality	1. Definition of radiographic image **2.** Components of the radiographic image: definition, factors affecting radiographic contrast, resolution, unsharpness and noise.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** classroom instruction and observation	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Recognize and explain sharpness of image, radiographic contrast and resolution.	1. Recognize sharpness of image, radiographic contrast and resolution.	

Sub-unit 3.2: Formation of latent image	**Theory: 3 Hrs**	**Lab/Practical: 1 Hr**
Enabling Objectives:	**Content:**	
1. Define latent image. 2. Explain mechanism of formation of latent image.	1. Definition of latent image. 2. Mechanism of formation of latent image: Gurney-Mott theory of latent image formation.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction and visual aids.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Demonstrate formation of latent image.	1. Demonstrate formation of latent image.	
Unit 4: Sensitometry and characteristic curve	**Theory: 15 Hrs**	**Practical: 5 Hrs**
Sub-unit 4.1: Sensitometry	**Theory: 3 Hrs**	**Lab/Practical: 1 Hr**
Enabling Objectives:	**Content:**	
1. Define Sensitometry. 2. Define Sensitometer. 3. Define step wedge. 4. Define densitometer. 5. Define spectral sensitivity. 6. Describe importance of spectral matching of radiographic film.	1. Definition of Sensitometry. 2. Definition of Sensitometer. 3. Definition of step wedge. 4. Definition of densitometer. 5. Definition of spectral sensitivity. 6. Importance of spectral matching of radiographic film.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction, observation and demonstration.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Recognize sensitometer. 2. Recognize Densitometer. 3. Recognize Aluminium step wedge.	1. Demonstration of sensitometer and its use. 2. Demonstration of densitometer. 3. Demonstration of aluminium step wedge.	
Sub-unit 4.2: Characteristic curve	**Theory: 12 Hrs**	**Lab/Practical: 4 Hrs**
Enabling Objectives:	**Content:**	
1. Define Characteristic curve. 2. Define photographic density (Optical density), Transparency and Opacity. 3. Describe history of characteristic curve. 4. Describe the process of preparation of characteristics curve. 5. Describe various regions of characteristics curve with their significances. 6. List applications of characteristic curve.	1. Definition of Characteristic curve. 2. Definition of photographic density (Optical density), Transparency and Opacity. 3. History of characteristic curve. 4. Process of preparation of characteristics curve: • Exposing and processing film • Measuring the densities produced • Plotting the graph 5. Features of characteristics curve: • The region left of the toe: Base	

	density, fog and threshold. • The region between toe and shoulder: contrast and latitude, gradient and gamma. • The region right of the shoulder: Maximum density and reversal. 6. Uses of characteristics curve.
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction, observation and demonstration.
Practical	
Performance Objectives:	**List of Tasks**
In radiography skill lab, students will able to: - Demonstrate Characteristic curve.	- Demonstrate characteristic curve for a particular film screen system.
Unit 5: Radiographic film processing	**Theory: 32 Hrs** **Practical: 6 Hrs**
Sub-unit 5.1: Manual film processing	**Theory: 20 Hrs** **Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**
1. Define Manual film processing. 2. Describe different steps of manual film processing. 3. Explain components of developer, and fixer solution with their functions. 4. Describe about accessories and equipment required for manual film processing. 5. Describe advantage and disadvantages of manual film processing. 6. Describe process of preparing developer and fixer solution.	1. Manual film processing 2. Processing cycle: **Development:** Describe constituents of developer, factors affecting development time, developer replenisher. **Rinsing:** Process of ringing **Fixation:** Describe constituents of fixer, factors affecting fixation and regeneration of the fixer. **Washing Process:** Process of washing and factors affecting washing time. **Drying Process:** Process of drying and factors affecting drying time. 3. Manual processing unit: Tanks and containers for processing chemicals, Film hangers. 4. Advantage and disadvantages of manual processing **5.** Process of preparing developer and fixer solution.
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction and visual aids and demonstration.
Practical	
Performance Objectives:	**List of Tasks**
In radiography skill lab, students will able to: 1. Recognize different accessories use during manual	1. Demonstrate of developing tank, fixing tank, washing tank, drier cabinet.

2. Film processing. 3. Prepare developer and fixer solution. 4. Process exposed film manually.	2. Demonstrate process of manual film processing.
Sub-unit 5.2: Automatic film processing	**Theory: 12 Hrs** **Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**
1. Define Automatic film processing. 2. Describe different steps of Automatic film processing. 3. Explain components of components of developer, and fixer solution with their functions. 4. Describe process of preparing developer and fixer solution Automatic film processing. 5. Describe about Automatic film processor. 6. Describe advantage and disadvantages of Automatic film processing. 7. Compare manual and automatic film processing.	1. Automatic film processing 2. Automatic Film Processing cycle: **Development:** Describe constituents of developer, factors affecting development time, developer replenisher. **Fixation:** Describe constituents of fixer, factors affecting fixation and regeneration of the fixer. **Washing Process:** Process of washing and factors affecting washing time. **Drying Process:** Process of drying and factors affecting drying time. 3. Process of preparing developer and fixer solution. 4. Automatic film processor (components). 5. Advantage and disadvantages of manual processing 6. Manual Vs automatic film processing.
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction, visual aids and demonstration.
Practical	
Performance Objectives:	**List of Tasks**
In radiography skill lab, students will able to: 1. Recognize different accessories use during 2. Automatic processing. 3. Prepare developer and fixer solution for automatic processor. 4. Process exposed film in automatic processor.	1. Identify components of automatic film processor. 2. Prepare developer and fixer solution. 3. Prepare developer and fixer solution for automatic processor. **4.** Process exposed film in automatic processor.
Unit 6: Digital image receptors	**Theory: 12 Hrs** **Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**
1. Define CR Cassette. 2. Define CR imaging Plate. 3. Describe construction of imaging plate. 4. Describe mechanism of image formation with use of CR imaging plate. 5. Describe mechanism of image formation of DR	1. Definition of CR Cassette. 2. Definition of CR imaging Plate. 3. Construction of CR imaging plate. 4. Mechanism of image formation with use of CR imaging plate. 5. Mechanism of image formation of DR

Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction, visual aids and demonstration.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Identify CR image receptor 2. Identify Detector panel. 3. Use CR cassette. 4. Use DR panel.	1. Identify CR image receptor. 2. Use CR cassette properly. 3. Use Detector panel properly.	
Unit 7: Image artifacts	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Enabling Objectives:	**Content:**	
1. Define artifacts. 2. Describe types of image artifacts.	1. Definition of image artifacts. 2. Image artifacts: Types (Processing artifacts, Exposure artifacts and Handling and storage artifacts) causes and remedies.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction and visual aids and demonstration.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Identify different type of film artifacts	1. Identify different type of film artifacts on radiograph	
Unit 8: Film processing areas	**Theory: 20 Hrs**	**Practical: 5 Hrs**
Sub-unit 8.1: Design and construction of darkroom	**Theory: 12 Hrs**	**Lab/Practical: 3 Hrs**
Enabling Objectives:	**Content:**	
1. Define film processing areas. 2. Define darkroom. 3. Prepare layout for darkroom construction.	1. Definition of processing areas. 2. Definition of darkroom. 3. Layout for darkroom construction: • Location • Construction of wall, floor and ceiling • Entrance and its type. • Ventilation. • Illumination: Safelight and white light. • Cassette hatches. • Loading bench and film hopper. Cupboard for film and chemical storage.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** classroom instruction and observation.	

Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Make a layout of dark room. 2. Observe construction of walls, floor & ceilings including ventilation, light tight system, illumination, safe light, cassette hatches, load bench and location of processors. 3. Observe the radiation protection measures in a dark room. 4. Prepare the dark room routine.	1. Prepare a layout of dark room. 2. Observe construction of walls, floor & ceilings including ventilation, light tight system, illumination, safe light, cassette hatches, load bench and location of processors. 3. Observe the radiation protection measures in a dark room. 4. Prepare the dark room routine.	
Sub-unit 8.2: Silver recovery	**Theory: 8 Hrs**	**Lab/Practical: 2 Hrs**
Enabling Objectives:	**Content:**	
1. Define Silver recovery. 2. Describe Purpose of silver recovery. 3. List sources of silver for recovery in radiology department. 4. Describe methods of silver recovery. 5. Define current density. 6. List advantages and disadvantages of electrolytic method and metal replacement method.	1. Definition of Silver recovery. 2. Purpose of silver recovery. 3. List sources of silver for recovery in radiology department. 4. Describe methods of silver recovery. • **Electrolytic Method:** Working principle, and structure of atypical unit of high-current-density electrolysis. • **Metallic Replacement Method:** Working principle and structure of base metal exchange unit. 5. Definition of current density. 6. Electrolytic method Vs Metal replacement method.	
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Instruction, observation and demonstration.	
Practical		
Performance Objectives:	**List of Tasks**	
In radiography skill lab, students will able to: 1. Identify the source of silver. **2.** Recover silver by electrolysis method.	1. Identify the source of silver. 2. Recover silver by electrolysis method.	
Unit 9: Identification & Presentation of the radiograph	**Theory: 12 Hrs**	**Practical: 4 Hrs**
Sub-unit 9.1: Patient Identification	**Theory: 8 Hrs**	**Lab/Practical: 2 Hrs**
Enabling Objectives:	**Content:**	
1. Define patient identification. 2. Describe the types of information included in patient identification. 3. Describe methods of recording information (Patient identification)	1. Definition of patient identification. 2. Types of information included in patient identification. Essential, technical and miscellaneous. 3. Methods of recording information:	

	opaque letters and legends, actinic marking and perforating device.
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom instruction and observation.
Practical	
Performance Objectives:	**List of Tasks**
In radiography skill lab, students will able to: 1. Identify patient identification on radiographic film. 2. Recognize different methods for patient identification on radiograph. **3.** Perform the technique for presenting the radiograph for reporting with documents.	1. Identify patient identification on radiographic film. 2. Recognize different methods for patient 3. Identification on radiograph. 4. Perform the technique for presenting the 5. Radiograph for reporting with documents.
Sub-unit 9.2: Presentation of Radiograph	**Theory: 4 Hrs** / **Lab/Practical: 2 Hrs**
Enabling Objectives:	**Content:**
1. Define view box. 2. Describe construction of viewing equipment (view box). 3. List features of good view box.	1. Definition of view box. 2. Construction of viewing equipment. 3. Features of good view box
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Classroom, instruction, observation and demonstration.
Practical	
Performance Objectives:	**List of Tasks**
In radiography skill lab, students will able to: 1. Identify different parts of view box. 2. Demonstrate function of view box.	1. Identify different parts of view box. 2. Demonstrate function of view box.
Unit 10: Handling and Storage of x-ray film	**Theory: 6 Hrs** / **Lab/Practical: 2 Hrs**
Enabling Objectives:	**Content:**
1. List different storage areas for x-ray film. 2. Explain ideal storage condition for x-ray film. 3. Describe technique for handling x-ray film in store.	1. Different storage areas for x-ray film: Hospital or department store, Darkroom store and storage in radiography room. 2. Ideal feature for x-ray film store: Location, Light, temperature, humidity, harmful gases and radiation sources. 3. Technique for handling x-ray film in store.
Evaluation methods: written exam and oral question.	**Teaching / Learning Activities / Resources:** Instruction, observation and demonstration.
Practical	
Performance Objectives:	**List of Tasks**
In radiography skill lab, students will able to: 1. Perform ordering and storage of x-ray films. 2. Use proper method for storage of chemical and film.	1. Perform ordering and storage of x-ray films. 2. Use proper method for storage of chemical and film.

Reference Books: Use APA Format

1. *Chesney's, Radiographic imaging. by John Balls & Tony Price*
2. *D.N & M.O.Chesney, Radiographic imaging*
3. *Robert Fosbinder, (2012). Essentials of Radiologic Science, Wolters Kluwer/Lippncott Williams & Wilkins*
4. *Fundamentals of radiographic photography by Kodak*

Reference books

1. *Radiologic Science for Technologists by S.C. Bushong*
2. *The essential physics of medical imaging by J.T. Bushberg*

Radiographic Equipment

Total Hours: 195	**Total Marks: 125**
Theory: 156 Hrs	**Theory: 100 (Internal: 20 + Final: 80)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course is designed to provide knowledge and skills on x-ray equipment and accessories used for general and special radiography. This course deals on historical background of x-rays and its production, control panel, x-ray tables and tube column. This course also deals on handling of fluoroscopic equipment, portable and mobile x-ray unit, Tomography and Vascular radiographic equipment. Additionally this course focuses on control of scattered radiation and familiarise with the recent imaging technology.

Course Objectives:

On the completion of the course, the learner will be able to:

1. Describe historical background of X-rays and method of its production,
2. Develop knowledge to Handle& operate with proper Care of various radiographic equipment
3. Understand scattered radiation, its effect and Control of scattered radiation.
4. Introduce recent imaging Modalities.

Course Contents:

Unit 1: X-ray Tube	**Theory: 21 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 1.1: History of discovery of X-ray & its production	**Theory: 5 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Explain x-ray discovery. 2. Describe principle of x-ray production. 3. Identify the early x-ray tubes and its development 4. Describe factors affecting quality and quantity of x-ray Production	1. History of X-ray discovery 2. Principle of x-ray production 3. Historical X-ray tubes; Coork's x-ray tube & Cooldage x-ray tube. 4. Factors affecting quality and quantity of x-ray Production	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	
Unit 1: X-ray Tube	**Theory: 21 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 1.2: Construction of X -ray tube	**Theory: 10 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe components of x-ray tubes. 2. Describe fixed anode x-ray tube and its components. 3. Describe rotating anode x-ray tube and its components 4. Describe anode angle and its significance 5. Describe line focus principle & anode heel effect.	1. Definition of X-ray tubes. 2. Descriptions of components of X-ray tubes 3. Line focus principle 4. Concept of anode angle and its choice 5. Anode heel effect and its applications.	

Evaluation methods: written exam, spotting, viva	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,

Unit 1: X-ray Tube	**Theory: 21 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 1.3: X -ray tube Rating & Fault	**Theory: 6 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define tube rating and its applications. 2. Discuss about cooling of x-ray tube. 3. Discuss about the different faults and their remedies, 4. Discuss about care and maintenance of x-ray equipment.	1. X-ray tube rating, types and their application 2. Different tube cooling methods and uses. 3. Common faults of x-ray tube, their effect and ways to prevent them. 4. Care and maintenance of x-ray Equipment	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	
Practical		
Performance Objectives:	**List of Tasks:**	
In Radiography Skill Lab, student able to 1. Identify the components of x-ray tube.	1. Identify different parts of Morden x-ray tube including cathode, filament, anode, target material, tube shieldings 2. Identify the Morden x-ray tubes including stationary and rotating anode.	
Evaluation methods: spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, lab instruction, poster preparations, presentation, supervised practical performance.	

Unit 2:Control Panel, x-ray table and tube support	**Theory: 19 Hrs**	**Lab/Practical: 4 Hrs**
Sub-unit : 2.1: Control Panel	**Theory: 9 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe the control panel 2. State the process of exposure control 3. Define exposure parameter.	1. Definition of Control Panel, its construction and working principle. 2. Use of various Knobs and indicators used in control panel. Mains Voltage Compensator. 3. Exposure parameters-KV selector, mA selector, Timer.	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	

Unit 2: Control Panel, x-ray table and tube support	Theory: 19 Hrs	Lab/Practical: 4 Hrs
Sub-unit : 2.2: X-ray Table	**Theory: 6 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define X-ray table. 2. Discuss about the Ideal features of x-ray table and construction of X-ray table. 3. Describe various types' of x-ray tables. 4. Discuss about the Bucky and its use and advantages.	1. Definition of X-ray table. 2. Ideal X-ray table and constructions of x-ray table 3. List of different types of x-ay tables and their use. 4. Bucky (horizontal & Vertical) along with their construction, working principle, uses, advantages and disadvantages.	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation	

Unit 2: Control Panel, x-ray table and tube support	Theory: 19 Hrs	Lab/Practical: 4 Hrs
Sub-unit : 2.3: X-ray Tube Support	**Theory: 4 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define X-ray tube support. 2. Describe about the various tube support systems. 3. Discuss about the Various locks and controlling systems used in x-ray tube support.	1. X-ray tube support and importance of tube support. 2. Descriptions of tube support systems including Ceiling support, Floor support, Ceiling to floor support and C-arm support system. 3. Detail about different lock used in each parts. Movement and access of tube.	
Evaluation methods: written exam, spotting, viva	**Teaching / Learning Activities / Resources:** classroom instruction, presentation	
Practical		
Performance Objectives:	**List of Tasks:**	
In Radiography skill lab, student able to: 1. Identify and handle the control panel. 2. Identify and handle different types of x-ray tables. 3. Identify and handle the locks used in tube support.	1. Identify control panel 2. Identify kV selector, mA selector and exposure timer 3. Identify and handle different types of x-ray tables. 4. Identify and handle different types of x-ray tube support.	
Evaluation methods: spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, lab instruction, poster preparations, presentation, supervised practical performance.	

Unit 3: Fluoroscopic equipment	**Theory: 22 Hrs**	**Lab/Practical: 4 Hrs**
Sub-unit : 3.1: Conventional Fluoroscopy	**Theory: 7 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Luminescence, fluorescence and phosphorescence 2. Define fluoroscopy 3. Describe the construction & working principle of conventional fluoroscopy 4. Describe limitations of conventional fluoroscopy.	1. Luminescence, fluorescence and phosphorescence 2. Fluoroscopy, Fluorescent screen, its construction including descriptions of all layers and materials used as phosphor. 3. Construction & working principle of conventional fluoroscopy 4. Limitations of conventional fluoroscopy	
Evaluation methods: written exam, spotting, viva	**Teaching / Learning Activities / Resources:** classroom instruction, presentation	
Unit 3: Fluoroscopic equipment	**Theory: 22 Hrs**	**Lab/Practical: 4 Hrs**
Sub-unit : 3.2: Modern Fluoroscopy	**Theory: 15 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define image intensifier tube. 2. Describe construction and working principle of Image intensifier tube 3. Describe advantages of II tube over conventional fluoroscopy. 4. Explain automatic brightness control (ABC). 5. Describe the TV monitoring and record of fluoroscopic images 6. Define Digital fluoroscopy	1. Definition of II tube, its components 2. Working Principle of II tube. 3. Automatic brightness control (ABC), Flux gain, and Minification gain. 4. Limitation of II tube, like vigneting. Distortion. 5. TV monitoring and recording of fluoroscopic images. 6. Definition of Digital Fluoroscopy	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation.	
Practical		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, student able to: 1. Identify different component of fluoroscopy equipment.	1. Identify fluoroscopic screen. 2. Identify component of fluoroscopic equipment- input screen, output screen	
Evaluation methods: spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, lab instruction, poster preparations, presentation, supervised practical performance.	

Unit 4: Scatter radiation and its control	**Theory: 23 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit : 4.1: Scatter radiation	**Theory: 8 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define scatter radiation. 2. Describe sources of scatter radiation 3. Describe the significance of scatter radiation.	1. Concept of scatter radiation 2. Sources of scatter radiation. 3. Significances of scatter radiation.	
Evaluation methods: written exam, spotting, viva,.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	

Unit 4: Scatter radiation and its control	**Theory: 23 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit : 4.2: Control of Scatter radiation	**Theory: 15 Hrs**	**Lab/Practical: 4 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. List out the methods of control of Scatter radiation. 2. Describe the various Beam limiting devices and their use. 3. Describe the Secondary radiation grid. 4. Describe about the grid movement	1. Techniques of controlling Scatter radiation (use of compression band and air gap technique). 2. Construction and working of different devices used to control scattered radiation including beam limiting devices. 3. Definition, construction and working of grid. Grid ratio, grid lattice and concept of proper choice of grid ratio. 4. Types of grids (Parrallel, Focused and crossed) and its movement 5. Advantages and disadvantages of grid.	
Evaluation methods: written exam, spotting, viva	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	
Practical		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, student able to 1. Identify and handle different devices to control scatter radiation.	1. Identify beam limiting devices-cone, diaphragm, LBD, beam centering device and compression devices. 2. Identify different types of grid.	
Evaluation methods: written exam, spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.	
Unit 5: Portable/Mobile X-ray equipment	**Theory: 17 Hrs**	**Lab/Practical: 6 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define portable & Mobile x-ray equipment 2. Explain component of Portable and mobile x-	1. Mobile and portable x-ray equipment. 2. Different components of Mobile and	

ray equipment. 3. Differentiate between mobile and portable x-ray equipment. 4. Describe types of mobile x-ray equipment. 5. List of use of portable, mobile x-ray equipment, and other Mobile/ Portable radiological equipment	portable x-ray equipment. 3. Comparison between mobile and portable x-ray. 4. Working mechanism of Condenser discharge mobile units 5. Working and proper use of Mobile image intensifier for O. T.
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,
Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab, student able to : 1. Identify components of portable and mobile x-ray equipment. 2. Demonstrate the performance of handling portable and mobile equipment.	1. Identify portable and mobile x-ray equipment- x-ray tube, tube stand, locks and components of control panel. 2. Demonstrate handling of portable and mobile x-ray equipment- x-ray tube, tube stand, locks and components of control panel.
Evaluation methods: written exam, spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.
Unit 6: Tomography	**Theory: 10 Hrs** / **Lab/Practical: 2 Hrs**
Theory	
Enabling Objectives:	**Content:**
1. Define Tomography 2. Describe the basic principles of tomography 3. List out the various movements used in tomography 4. Define Zonography	1. Definition of Tomography. 2. Basic principle of tomography 3. Different moments and planes of tomography- Linear, circular, elliptical, hypocycloidal, spiral and figure of 8. 4. Zonography
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,
Practical	
Performance Objectives:	**List of Tasks:**
In radiography skill lab, student able to: 1. Identify Tomographic equipment with different movement.	1. Identify different movement - Linear, circular, elliptical, hypocylodial, spiral and figure of 8.
Evaluation methods: written exam, spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.

Unit 7 : Equipment for Vascular Imaging Technology	**Theory: 12 Hrs**	**Lab/Practical: 4 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Discuss about the various equipment used during vascular imaging. 2. Discuss about the angiographic table and its use. 3. Discuss the working and use of automatic pressure injector 4. Define Digital subtraction angiography (DSA)	1. Vascular imaging equipment and its working 2. Angiographic tables: basic constructions, types and uses 3. Pressure injector: its basic settings, use and advantages 4. Definition of DSA and use.	
Evaluation methods: written exam, spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.	
Practical		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, students able to: 1. Identify different vascular equipment	1. Identify different size of catheter, guide wire, 2. Identify auto injector 3. Identify angiographic table.	
Evaluation methods: written exam, spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.	
Unit 8 : Introduction to Modern Medical Imaging Modalities	**Theory: 32 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit : 8.1: Computerized Radiography (CR)	**Theory: 10 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define CR 2. Define PSP Plate, and discuss the construction of PSP 3. Define CR cassette and discuss the basic construction of CR cassette. 4. Identify the various components used in CR. 5. Discuss the basic process of image formation in CR.	1. Definition of CR. 2. Definition of PSP, construction and working of PSP 3. Construction of CR Cassette. 4. Working of different components of CR. 5. Basic concept of image formation in PSP plate and Scanning of PSP plate to form image.	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	
Unit 8:Introduction to Modern Medical Imaging Modalities	**Theory: 32 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit :8.2: Direct Digital Radiography (DR)	**Theory: 8 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define DR	1. Definition of DR.	

2. Define briefly about Detector, and discuss the construction of scintillation Detector in brief. 3. Identify the various components used in DR. 4. Discuss the basic process of image formation in DR. 5. Differentiate between CR and DR	2. Definition of Detector, construction and working of Scintillation Detector. 3. Working of different components of DR. 4. Basic concept of image formation in DR. 5. Differentiate between CR and DR	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	
Unit 8: Introduction to Modern Medical Imaging Modalities	**Theory: 32 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit :8.3: Mammography	**Theory: 4 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Mammography 2. Basic principle of Mammography. 3. Describe components of Mammography including importance of compression cups. 4. Discuss about the Use of Mammography.	1. Definition and basic concept of Mammography. 2. Discussion of mammography x-ray tube, filters used and factors used. 3. Brief introductions and working of different components of Mammography. 4. Use of Mammography.	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.	
Unit 8 : Introduction to Modern Medical Imaging Modalities	**Theory: 32 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit :8.4: CT and MRI	**Theory: 10 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define CT & describe basic principle of CT. 2. Discuss about the Use of CT. 3. Define MRI & Discuss basic principle of MRI. 4. Discuss about the Use of MRI.	1. Definition and basic principle of CT. 2. Use of CT scan. 3. Definition and basic principle of MRI. 4. Use of MRI.	
Evaluation methods: written exam, spotting, viva,	**Teaching / Learning Activities / Resources:** classroom instruction, presentation,	
Practical		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, the students able to 1. Identify the different modern imaging modalities	1. Identify CR cassette 2. Identify PSP 3. Identify Detector 4. Identify Mammography machine.	
Evaluation methods: written exam, spotting, viva, performance observation in practical setting.	**Teaching / Learning Activities / Resources:** classroom instruction, presentation, supervised practical performance.	

Reference Books:

1. *Chesneys' equipment for student radiographers - By,**P. H. Carter, A. M. Paterson, M. L. Thornton, A. P. Hyatt, A. Milne, J. R. Pirrie***
2. *Physic and Equipment in imagine modalities -**By, Stephanie Mass***
3. *Physics of Radiology and Imaging - **By, K Thylan***
4. Christensen's Physics of Diagnostic Radiology **-By, Thomas S. Curry III MD (Author), James E. Dowdey PhD (Author), Robert E. Murry Jr. PhD (Author)**

Basic Radiation Physics

Total: 195 Hrs	**Total Marks: 125**
Theory: 156 Hrs	**Theory: 100 (Internal: 20 + Final: 80)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course is designed to provide specific knowledge and skills on x-ray production and radiation protection. This course deals with electricity static & current/ x-ray tubes & valves x-ray, interaction of x-ray, x-ray measurement, Radiation protection.

Course Objectives:

On the completion of the course, the learner will be able to:

1. Describe static electricity, current electricity and thermionic emission
2. Describe the principle and handling of X-ray equipment.
3. Describe principles of radiation protection and electrical hazards.
4. Describe principle of radiation biology and effects of radiation on human body.

Course Contents:

Unit 1: Electricity & x-ray apparatus	**Theory: 40 Hrs**	**Lab/Practical: 12 Hrs**
Sub-unit 1.1: Static & Current Electricity	**Theory: 25 Hrs**	**Lab/Practical: 7 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Explain the Principle of capacitor and factor affecting capacitance. 2. Define dielectric. 3. Solve simple numerical of capacitors based on formula. 4. Describe types of currents- AC/ DC. 5. Describe concepts of self and mutual inductions. 6. Describe of different types of transformers 7. Solve problem based on voltage and current of transformer.	1. Principle of capacitor (parallel plate only) & the factors, which affect the capacitance of a capacitor. Series & parallel connections of the capacitors in detail. Charging and discharging of capacitors. 2. Concept of dielectric. 3. Numerical problems on capacitors. 4. Principle & construction of the moving coil matter. 5. Electromagnetic induction & state its laws. Concepts of mutual &self-induction. 6. Alternating current, Direct current & state their advantages and disadvantages. 7. Generation, frequency, losses from peak & effective values of alternating current, transformer & state its types. Construction, principle, losses, efficiency & regulation of a transformer. Turns ratio, current ratio, voltage ratio & state their relation. 8. Simple problems on transformer. 9. Low & high-tension transformer.	

Evaluation methods:: written exam	**Teaching / Learning Activities / Resources:** classroom instruction, practical
Practical	
Performance Objectives:	**List of Tasks:**
In physics lab, students will able to:- Observe the use of different electronic devices working on static electricity.	1. Observe the use of capacitor (parallel plate only) & the factors, which affect the capacitance of a capacitor. 2. Observe charging & discharging of a capacitor through a resistor. 3. Solve the simple problems on capacitors.
Evaluation methods: written / oral/ viva exam	**Teaching / Learning Activities / Resources:** classroom instruction, practical observation

Unit 1: Electricity & x-ray apparatus	**Theory: 40 Hrs**	**Lab/Practical: 15 Hrs**
Sub-unit : 1.2: Thermionic emission- tubes & valves	**Theory: 15 Hrs**	**Lab/Practical: 5 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define thermionic emission. 2. Describe different types of diodes. 3. Explain self-rectified circuits and its disadvantages. 4. Explain Full wave and half wave circuits. 5. Describe Potential hazards of circuits. 6. Demonstrate measurements of voltages. 7. Explain high voltage generator. 8. Define X-ray accessories. 9. Define different types of wiring and switching.	1. Thermionic emission, variation of electron emission with temperature construction, principle & characteristics of a diode. 2. Construction & principle of a cold cathode gas filled diode. 3. Self-rectified circuit with diagram& its disadvantage in a x-ray production. 4. Half-wave (two valve) & full wave (four-valve fridge) circuits with diagram. 5. Hazards of electric fire in the use of x-ray apparatus and the precautions to be taken against the hazards 6. The generator symmetry & its necessity in rectifier circuit 7. Two types of measurement of high voltage 8. The main parts involved in x-ray generator with diagram 9. The uses of x-ray cable fuses, switches, earthling & insulation 10. Wirings (single phase, three phases), switches (one way, two ways) & fuses.	
Evaluation methods: written exam	**Teaching / Learning Activities / Resources:** classroom instruction, practical observation	

<table>
<tr><td colspan="3">Practical</td></tr>
<tr><td>Performance Objectives:</td><td colspan="2">List of Tasks:</td></tr>
<tr><td>In physics lab, students will able to:-

Identify the use of different electronic devices and accessories.</td><td colspan="2">1. Observe different types of diode.
2. Observe self-rectified circuit.
3. Observe the half-wave & full wave circuits.
4. Observe types of measurement of high voltage
5. Draw a diagram of x-ray generators
6. Observe x-ray cable fuses, switches, earthling & insulation including necessary wirings in switches & fuses.</td></tr>
<tr><td>Evaluation methods: written exam/oral/viva</td><td colspan="2">Teaching / Learning Activities / Resources:
classroom instruction, practical observation</td></tr>
<tr><td>Unit 2: Radiation physics</td><td>Theory: 61 Hrs</td><td>Lab/Practical: 12 Hrs</td></tr>
<tr><td>Sub-unit: 2.1. Atomic Structure, X-Ray production & Radioactivity.</td><td>Theory: 30 Hrs</td><td>Lab/Practical: 5 Hrs</td></tr>
<tr><td colspan="3">Theory</td></tr>
<tr><td>Enabling Objectives:</td><td colspan="2">Content:</td></tr>
<tr><td>1. Describe Atomic structure & Energy level in atom.
2. Explain Ionization and excitations.
3. Explain fundamental theory of radioactivity
4. Describe EMR, Production of X-rays.
5. Detail study of factors influencing quality and intensity of an x-ray.
6. Define Radiation Intensity and the Inverse Square Law</td><td colspan="2">1. Proton, electron, neutron mass number & atomic number energy level of K, L, and M. etc shells in an atom.
2. Ionization & excitation; isotopes, isobar & isomer.
3. Radioactivity (alpha particles, beta particles, gamma particles) and Half-Life,.
4. Electromagnetic radiation; explain the production of x-rays, characteristic & continuous spectrum of an electromagnetic radiation.
5. Explain the factors influencing quality and intensity of an x-ray:
a. Tube current
b. Tube voltage
c. Added filtration
d. Target material
e. Voltage waveform
f. Filtration
6. Define radiation intensity and Explain Inverse square law and solve simple problems</td></tr>
<tr><td>Evaluation methods: written exam</td><td colspan="2">Teaching / Learning Activities / Resources:
classroom instruction, practical observation</td></tr>
</table>

<table>
<tr><td colspan="3">Practical</td></tr>
<tr><td>Performance Objectives:</td><td colspan="2">List of Tasks:</td></tr>
<tr><td>Practical observations
.</td><td colspan="2">1. Construct spectrum of an electromagnetic radiation.
2. Perform simple calculations of the exponential law.</td></tr>
<tr><td>Evaluation methods: written exam</td><td colspan="2">Teaching / Learning Activities / Resources:
classroom instruction, practical observation</td></tr>
<tr><td>Unit 2: Radiation physics</td><td>Theory: 47 Hrs</td><td>Lab/Practical: 14 Hrs</td></tr>
<tr><td>Sub-unit : 2.2 Interaction of X-Ray with matter</td><td>Theory: 41 Hrs</td><td>Lab/Practical: 7 Hrs</td></tr>
<tr><td colspan="3">Theory</td></tr>
<tr><td>Enabling Objectives:</td><td colspan="2">Content:</td></tr>
<tr><td>1. Explain interaction of radiation with matter
2. Define HVL
3. Define attenuation, absorption & scattering
4. Define exponential laws.
5. Define attenuation coefficient and linear attenuation coefficient.
6. Describe Radiation Measuring devices: Free air ionisation chamber, Thimble ionisation chamber and Condenser ionisation chamber.
7. Define fundamental units of Radiation.</td><td colspan="2">1. Interaction of radiation with matter-
a. coherent scattering
b. photoelectric effect
c. Compton scattering
d. pair production
e. photodisintegration
2. Half-value layer, effective photon energy and intensity or quantity (exposure, roentgen) of an x-ray.
3. Attenuation, absorption & scattering of the radiation- Atomic number (Z) of atoms in tissue The mass density of tissue, the x-ray energy
4. Exponential law.
5. Attenuation coefficients. Linear attenuation coefficient, Establish the relation between attenuation coefficient & half value layer, explain filtration & filters.
6. X-ray detection& x-ray measurements; construction & working of a free air ionisation chamber, Thimble ionisation chamber and condenser ionization chamber.
7. Conventional and SI unit of Radiation.</td></tr>
<tr><td>Evaluation methods: written exam/ oral / viva</td><td colspan="2">Teaching / Learning Activities / Resources:
classroom instruction, practical observation</td></tr>
<tr><td colspan="3">Practical</td></tr>
<tr><td>Performance Objectives:</td><td colspan="2">List of Tasks:</td></tr>
<tr><td>Students should be able to:
1. Identify- attenuation, HVL, filter and its implementation.
2. Observe radiation measuring device and their uses.</td><td colspan="2">1. Observe different types of filters used in radiology department
2. Observe the process of radiation measuring devices.</td></tr>
<tr><td>Evaluation methods: written exam</td><td colspan="2">Teaching / Learning Activities / Resources:
classroom instruction, practical observation</td></tr>
</table>

Unit 3: Radiation protection	**Theory: 40 Hrs**	**Lab/Practical: 10 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Explain historical background of radiation protection. 2. Describe Principle of Radiation protection 3. Define Dose limits 4. Explain ICRP Recommendations. 5. List different protective devices. 6. State the requirements for personnel monitoring. 7. Describe Radiation monitoring devices. 8. Describe Limitations of radiation during procedures.	1. Historical introduction of radiation protection. 2. Cardinal principle of Radiation protection. 3. Maximum permissible dose/Dose limits. 4. Justification, optimization and dose limitation. Tabulation of the recommended dose limits for the different parts of the body. 5. Lead apparels, lead equivalent and lead thickness variation with quality of beam. 6. Protective materials and lead impregnated substances & building material for ionizing radiation. 7. Personnel monitoring instruments including film badge & thermo-luminescent dosimeter (TLD). 8. Basic techniques for diagnostic uses of x-rays to limit the exposure of the patients to minimum value & to protect other persons from ionizing radiation.	
Evaluation methods: written exam	**Teaching / Learning Activities / Resources:** classroom instruction, practical observation	
Practical		
Performance Objectives:	**List of Tasks:**	
Students should be able to: 1. Understand and use of various protective devices and personnel monitoring devices.	1. Observe the protective materials and lead impregnated substances & building material for ionizing radiation. 2. Lead gloves, thyroid shields, lead goggles, lead apron etc. 3. Observe personnel monitoring & monitoring instruments including film badge, ionisation chamber & thermo-luminescent dosimeter (TLD).	
Evaluation methods: written exam	**Teaching / Learning Activities / Resources:** classroom instruction, practical observation	

Unit 4: Radiation biology	**Theory: 15 Hrs**	**Lab/Practical: 5 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define Radiation biology 2. Identify the relative radiation sensitivity of	1. Radiation biology. 2. Radiation sensitivity of some cells,	

human cell. 3. Define Law of Bergonie and Tribondeau. 4. Explain Biological effects of Ionizing Radiation.	Tissues, and Organs.(Tissue weighting factor). 3. Law of Bergonie and Tribondeau. 4. Stochastic Effects and Nonstochastic /deterministic effects.
Evaluation methods:written exam/ oral / viva	**Teaching / Learning Activities / Resources:** classroom instruction, practical observation
Practical	
Performance Objectives:	**List of Tasks:**
Overall practical knowledge of radiation biology.	1. Name different types of radiosensitive cells. 2. Practical knowledge application of law of bergonie and tribondeau. 3. Enlist the name of stochastic and nonstochastic effects. 4. Demonstrate practices of protective device and monitoring devices during pregnancy.
Evaluation methods: written exam	**Teaching / Learning Activities / Resources:** classroom instruction, practical observation

Textbooks

1. *First Year Physics for Radiographer – George A Hay*

Reference Books: Use APA Format

1. *X-ray Physics and Equipment - Ashworth*
2. *Physics of Radiology – Johns Charles*
3. *Physic and Equipment in imagine modalities- Stephanie Mass*

Radiological Anatomy

Total Hours: 117	**Total Marks: 75**
Theory: 78 Hrs	**Theory: 50 (Internal: 10 + Final: 40)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course is designed to provide knowledge and skills on Radiological Anatomy in radiological perspective. This course includes anatomical terms, bones and joints, muscular system, digestive system, cardiovascular system, respiratory system, lymphatic system, urinary system, reproductive system, endocrine system, nervous system and surface anatomy.

Course Objectives:

After successfully completing this course the student will be able to;

1. Describe and identify different anatomical parts in the radiograph and the body structures in carrying out radiological procedure.
2. Explain and identify different anatomical landmarks and relation of different organs in radiography.
3. Should be able to identify normal radiograph.

Course Contents:

Unit 1: Anatomical Terminology	**Theory: 5 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Identify anatomical position 2. Enable to identify basic planes and their relation with each other. 3. Recall various important anatomical terminologies. 4. Enable to describe different radiographic positions.	1. Anatomical position. a. Viewing radiograph. 2. Sagittal, coronal, axial. 3. Anterior, posterior, dorsal, ventral, supine, prone, erect, medial, lateral, superior, inferior, cranial, caudal, flexion, extension, abduction, adduction, circumduction, rotation, proximal, distal, oblique, decubitus, superficial, deep, palmar, plantar, inversion, eversion. apical, foramen, condyle, fossa, process and other important cross sectional anatomical terminology. 4. Posteroanterior, anteroposterior, RAO, LAO, RPO, LPO, dorsal decubitus, ventral decubitus, lateral decubitus. OF, OM.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomical Skill lab- students able to: 1. Identify anatomical position 2. Enable to identify basic planes and their relation with each other.	Identify anatomical position, Sagittal, coronal, axial, Anterior, posterior, dorsal, ventral, supine, prone, erect, medial, lateral, superior, inferior, cranial, caudal, flexion, extension, abduction,	

3. Enable to describe different radiographic positions.	adduction, circumduction, rotation, proximal, distal, oblique, decubitus, superficial, deep, palmar, plantar, inversion, eversion. Apical, foramen, condyle, fossa, process, Posteroanterior, Anteroposterior, RAO, LAO, RPO, LPO, dorsal decubitus, ventral decubitus, lateral decubitus. OF, OM. Identify border, canal, condyle, epicondyle, foramina, fossa, process, spine, surface, tubercle, trochanter.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-ppt presentations, textbooks.

Unit 2: Bones and Joints	**Theory: 14 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit 2.1: Bones	**Theory: 12 Hrs**	**Lab/Practical: 6 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe composition of Bone. 2. Enumerate function of Bone. 3. Describe ossification. 4. List types of bone. 5. Identify and describe structure of bones.	1. Composition of Bone. 2. Function of Bone. 3. Process of Ossification. 4. Types of Bones- according to Position composition, shape and ossification. 5. Structure and Function of following bones. a) Classification, structure and functions of the following bones: i) Cranial bones ii) Facial bones and nasal sinus iii) Teeth structure and eruption process. b) ossification and detailed anatomy of followings i) Clavicle, scapula, humerus, ulna, radius, carpals, metacarpals and phalanges. ii) Femur, tibia, fibula, tarsals, rnetatarsals and phalanges. c) Bones of axial skeleton.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-ppt presentations, textbooks.	

Unit 2: Bones and Joints	**Theory: 14 Hrs**	**Lab/Practical: 7 Hrs**
Sub-unit 2.2: Joints	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Define Joint. 2. List Functions of Joints. 3. Explain types of Joint and the movement of joint.	1. Definition of Joint 2. Functions of Joints 3. Types of joints a. Fibrous, cartilaginous and synovial joint. b. Characteristics of Synovial Joint. c. Process of movement of different joints.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, slides-ppt presentations, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomy skill Lab, student able to: 1. Identify and describe of structure of different bones. 2. Identify different Joints and the movement possible with joint.	1. Identify the parts of the following bones a. Cranial bones b. Facial bones and nasal sinus c. Teeth structure and eruption process. 2. Observe the ossification centers on the x-ray. 3. Identify the parts a. Clavicle, scapula, humerus, ulna, radius, carpals, metacarpals and phalanges. b. Femur, tibia, fibula, tarsals, Metatarsals and phalanges. 4. Identify joints in human body **5.** Observe the movements of the following joints: shoulder, sterno-clavivular, elbow, wrist, hip, knee, foot, ankle, sacroiliac, temporomancibular, intervertebral, interphalangeal, atlantooccipital	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 3: Muscular System	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. List the functions of Muscles. 2. Describe types of Muscle. 3. Identify Major Muscles and enumerate its functions.	1. Functions of Muscles. 2. Skeletal, Smooth and Cardiac Muscle. 3. Identification of Major Muscles around Major Joints. 4. Origin, Insertion, Location and Function of these Muscles. -Respiratory Muscles-External and internal	

	intercostal muscles, Diaphragm. -Pectoralis Major and Minor muscle. -Rotator cuff muscles. -Psoas Muscle. 5. Muscles used for giving IM injection.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts

Practical	
Performance Objectives:	**List of Tasks:**
In anatomy skill lab, student able to: 1. Identify major muscles around major joints. 2. Identify Major muscles on radiograph. 3. Identify Surface marking of some important muscle and their action	1. Identify major muscles around major joints and also able to identify them on radiograph. (Diaphragm, psoas, pectoralis Major). 2. Identify surface marking of some important muscle and their action. 3. Identify Muscles used for giving IM injection.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, textbooks.

Unit 4: Digestive system	**Theory: 10 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 4.1: Alimentary Canal	**Theory: 6 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. List the Part of Alimentary canal. 2. List functions of GI system. 3. Enable to describe Structure of GI tract and its modifications. 4. Describe the name of radiological investigations done to view different part of alimentary canal. 5. Describe Process of Digestion.	1. Parts of Alimentary canal. 2. Function of GI system and its different parts. 3. Structure of GI Tract and its modification in different parts of GI tract. 4. Comparison between Small and Large intestine. 5. List of Radiological investigations for different parts of GI system 6. Digestion of fat, carbohydrate and Protein.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts	

Unit 4: Digestive system	**Theory: 10 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 4.2 Accessory Glands of GI tract.	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. List the name of accessory glands of GI tract. 2. Describe location, structure and function of Liver and bile ducts.	1. Salivary Glands, Pancreas and Liver. 2. List the Location, structure, function of liver, pancreas and salivary glands. - Composition and function of saliva, Gastric juice, pancreatic juice, and bile. - Biliary Tree.	

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.
Practical	
Performance Objectives:	**List of Tasks:**
In anatomy skill Lab, student able to: 1. Identification of different organs and structures of Digestive system and should be able to identify them on Radiograph.	1. Identify the salivary glands, pharynx, esophagus, stomach, liver, gall bladder, biliary tract, pancreas, small intestine, large intestine, rectum and anus.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.

Unit 5: Respiratory system	**Theory: 5 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe the structure, location and function of Airway and Lungs. 2. Describe the process of Respiration.	1. Functions of respiratory system 2. Size, shape, relationship and functions of Naso-pharynx, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and pleura. 3. Structure of thoracic cage and diaphragm 4. Process of respiration 5. Outline of pleura and lungs with surface marking	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomy skill Lab, student able to: 1. Identification of different organs and structures of Respiratory system and should be able to identify them on Radiograph.	1. Identify naso-pharynx, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and pleura. 2. Identify thoracic cage and diaphragm	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, textbooks.	

Unit 6: Cardiovascular system	**Theory: 10 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 6.1: Blood and its constituents	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Describe Composition of Blood and function of its constituents. 2. Describe Function of Blood.	1. Composition of Blood-Plasma and Blood Cells. 2. Function of Blood and its different constituents. 3. Normal Level of Blood Urea and Creatinine and its significance.	

Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.

Unit 6: Cardiovascular system	**Theory: 10 Hrs**	**Lab/Practical: 5 Hrs**
Sub-unit 6.2: Heart & Major blood vessels	**Theory: 8 Hrs**	**Lab/Practical: 4 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe the structure of the heart 2. Describe Circulation of blood 3. Outline the conducting system of the heart 4. Explain the relationship between the different types of blood vessel 5. Describe the Circulation of blood to the major organs of Body. 6. Describe pulmonary circulation.	1. Structure of Heart and its location inside chest. 2. Circulating of Blood in heart (external and internal). 3. Conduction system of heart. Relate the electrical activity of the cardiac conduction system to the cardiac cycle. 4. Structures and functions of arteries, veins and capillaries. 5. Branches of Aorta and its supply. 6. Portal circulation- formation of portal vein and its tributaries. 7. Pulmonary circulation	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomy skill Lab, student able to: 1. Identify the different structures in the heart. 2. Identify the major blood vessels in the body with surface marking.	1. Identify the different structures in the heart. 2. Identify the major blood vessels in the body with surface marking. 3. Identify Boundary of heart on chest X-ray.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Unit 7: Lymphatic system	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Describe the composition and the main functions of lymph. 2. List the main lymph vessels and the area drained by them. 3. Explain structure and function of lymph nodes, spleen and thymus	1. Definition of Lymph. Composition and function of lymph. 2. Lymph vessels- Thoracic duct and right lymphatic duct and area drained by them. 3. Structure and function of lymph nodes. -Spleen, thymus.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Practical	
Performance Objectives:	**List of Tasks:**
In anatomy skill Lab, student able to: 1. Identify important groups of lymph nodes.	1. Identify location of important groups of lymph nodes.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.

Unit 8: Urinary System	**Theory: 6 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Identify the organs associated with Urinary System. 2. Outline the gross structure of the kidneys; describe the structure of a nephron. 3. Explain the processes of Urine formation	1. Size, shape, relationship and functions of the organs associated with urinary system including kidney, ureter, urinary bladder and urethra 2. Surface marking of kidneys 3. Process of formation of urine and its composition	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomy skill Lab, student able to: 1. Identify kidney, ureter, urinary bladder and urethra.	1. Identify kidney, ureter, urinary bladder and urethra and should identify them on radiograph.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 9: Endocrine system	**Theory: 6 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define hormone and its function. 2. Describe location, structure and functions of hormones secreted by different endocrine glands. 3. Describe Positive and negative feedback mechanism.	1. Definition of hormone and its function. 2. Location, Structure, functions of Pituitary, Thyroid, Parathyroid, Pancreas, Suprarenal, Ovary, and Testis. 3. Positive and negative feedback mechanism with its example.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Practical	
Performance Objectives:	**List of Tasks:**
In anatomy skill Lab, student able to: 1. Identify major endocrine glands.	1. Identify Pituitary, Thyroid, Parathyroid, Pancreas, Suprarenal, Ovary and Testis.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Instruction, handouts, presentations, textbooks.

Unit 10: Reproductive System	**Theory: 4 Hrs**	**Lab/Practical: 3 Hrs**
Sub-unit 10.1: Female Reproductive system	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Describe the main structures of the external and Internal Genitalia. 2. Discuss the process of ovulation and the hormones that control it. 3. Describe Physiology of menstruation 4. Describe the structure and function of the female breast.	1. External and internal genital organs. 2. Location, structure and function of vagina, uterus, uterine tubes and ovary. 3. Process of Menstruation and ovulation. 4. Location, structure and function of Breast.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Unit 10: Reproductive System	**Theory: 4 Hrs**	**Lab/Practical: 3 Hrs**
Sub-unit 10.2: Male Reproductive system	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
1. Describe the structure and function Male Reproductive organs.	1. Location, structure and function of testes, epididymis, vas deference seminal vesicles, ejaculatory duct and prostate.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Instruction, handouts, presentations, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomy skill Lab, student able to: 1. Identify the organs of male and female reproductive system.	1. Identify the organs of male and female reproductive system.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 11: Nervous System	**Theory: 8 Hrs**	**Lab/Practical: 4 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Classify and enumerate the function of nervous system. 2. Describe brain, spinal cord, spinal nerves	1. List function of nervous system. 2. Location, structure and function of brain and spinal cord. Meninges –layer and function.	

and cranial nerves. 3. Describe CSF formation & Circulation 4. Define nerves and plexus. 5. Describe structure and function of special senses.	3. Formation and circulation of CSF. 4. Cranial nerves, spinal nerves and nerve plexus. 5. Structure and function of organs of special senses.
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.
Practical	
Performance Objectives:	**List of Tasks:**
In anatomy skill Lab, student able to: 1. Identify major organs of nervous system.	1. Identify brain, spinal cord 2. Identify organs of special sense
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.

Unit 12: Surface Anatomy	**Theory: 4 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Identify the different organs on the body surface. 2. Identify the different land marks of radiological importance in human body.	1. Anatomy of the skeleton and body systems from planar and cross sectional radiographic images. 2. Radiographic appearance, location, vertebral levels and anatomical relationships of major organs, vessels and structures. 3. Surface markings, relating them to internal anatomy and radiographic appearance.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Practical		
Performance Objectives:	**List of Tasks:**	
In anatomy skill Lab, student able to 1. Identify surface landmark of different body parts.	1. Identify the different organs on the body surface 2. Identify the different bones of radiological importance in human body 3. Identify the different land marks of radiological importance in human body	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Reference Books:

1. WaughAnne;Grant Allison. 2014, Ross and Wilson, **Anatomy and Physiology in Health and Illness:** Edinburgh: Churchill Livingstone Elsevier.
2. Warrick C.K. ***Anatomy and Physiology for Radiographers:*** Hodder Arnold.
3. Halim A. ***Surface and Radiological Anatomy***: CBS Publishers & Distributors.
4. Glenister T W A; Ross Jean R W. **Anatomy and physiology for nurses:** London, Heinemann.
5. ***Moeller Torsten, Reif Emil.Pocket Atlas of Sectional Anatomy: Computed Tomography and Magnetic Resonance Imaging:*** Thieme.
6. Stephanie Ryan, Michelle McNicholas and Stephen J Eustace. **Anatomy for Diagnostic Imaging:** Saunders Ltd.

Basic Public Health

Total Hours: 195	**Total Marks: 125**
Theory: 156 Hrs	**Theory: 100 (Internal: 20 + Final: 80)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course is designed to help students to acquaint knowledge and skills on basic public health and health care delivery system of Nepal in broader perspectives. This course deals with basic epidemiology, hygiene and sanitation, waste disposal methods, basics of nutrition. This course also deals on medical ethics and introduction on Biostatistics and research.

Course Objectives:

On the completion of the course, the learner will be able to:

1. Define public health, state the importance and scope of public health
2. Define epidemiology, identify modes of disease transmission
3. Identify the sources of water and methods of purifications,
4. Enumerate types of solid wastes and methods of its disposal,
5. Identify food borne infections and food poisoning,
6. Describe the effects of poor housing and ways for improved housing,
7. Familiarize with health care delivery system in Nepal,
8. Comprehend health care data system,
9. Orient with ethical aspects and professional standard.

Course Contents:

Unit 1: Introduction to public health	**Theory: 20 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Define public health. 2. Explain about the era of public health. 3. Discuss the scope like environmental control. Communicable disease control, Non communicable disease control and personal health service. 4. Discuss about the individual. Group and mass method. 5. Discuss about importance of public health in different aspect like identify health problems and priorities, promotion and prevention approach, how to prevent epidemics, endemics, pandemics and injury etc.	1. Definition of Public health. 2. Definition and concept of Community health 3. Scope and method environmental control, Communicable disease control, Non communicable disease control and personal health service. 4. Importance of public health in different aspect like identify health problems and priorities, promotion and prevention approach, how to prevent epidemics, endemics, pandemics and injury etc 5. Application of public health in diagnosis	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching/Learning Activities/Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 2: Basic Epidemiology	**Theory: 20 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Definition, concept and contribution of epidemiology. 2. Explain the traditional model of infectious disease causation by epidemiologic traid. 3. Discuss about measurement of epidemiology on the basis of frequency, distribution and determinant. 4. How and what are the measure of transmitted, prevented and control of disease. 5. Explain about the Immunization schedule of Nepal and about the different vaccine. 6. Discuss about screening of diseases.	1. Introduction and concept of epidemiology 2. Descriptions of Epidemiologic triad 3. Epidemiologic measurements 4. Disease transmission, prevention and control 5. Immunization 6. Screening	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 3: Basic hygiene and sanitation	**Theory: 25 Hrs**	**Lab/Practical: 24 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Explain the relationship between water and health 2. Define air and its source, indicators health effect prevention and control of air pollution. 3. Explain Current scenario of air pollution in Nepal. 4. Explain about the noise pollution, housing and ventilation and its source, health effect and prevention and control. 5. Explain the major problems due to lack of sanitation. 6. Explain some of the options for improving sanitation and hygiene by water purification and sterilization.	1. Explanation of the relationship between water and health 2. Definition of air and its source and details of indicators health effect prevention and control of air pollution. 3. Current scenario of air pollution in Nepal. 4. Explanation about the noise pollution, housing and ventilation and its source, health effect and prevention and control. 5. Major problems due to lack of sanitation 6. Options for improving sanitation and hygiene by water purification and sterilization.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Practical	
1. Analyse the existing drinking water source, waste disposal system, food preparation, preservation technique and measures to control rodent and insects. 2. Identifytheneedsofthecommunityregardingpersonalhygieneandenvironmentalsanitation. 3. Educatethecommunityforsafehygienicpracticesandmaintenanceofsanitarylatrine. 4. Cooperate with other team members in sanitary activities in the community.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.

Unit 4: Health education and health promotion	**Theory: 20 Hrs**	**Lab/Practical: 10 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Discuss about the health education and promotion. Scope, aim and objective of health promotion. 2. Explain about methods of communication. 3. Explain about method like individual, group and mass and media as audio, visual and audio-visual aids. 4. Explain about the importance health education.	1. Introduction 2. Communication process 3. Health education methods and media 4. Importance of health education	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Practical		
1. Conduct educational diagnosis survey to identify the health education need of a selected community. 2. Prepare a modular health education plan for deliberation of health education in selected community or health post. 3. Use following health education method effectively i) Communication exercise ii) Group discussion iii) Role play iv) Counseling v) Lecture vi) Demonstration and vii) Exhibition 4. Collect health education materials from different organization. 5. Prepare simple media for health education like viii) Poster ix) Flannel graph		

x) Models xi) Charts and graphs xii) Puppets **xiii)** Pamphlets

Unit 5: Nutrition	**Theory: 20 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Classify food on the basis of chemical composition, origin and source. 2. Explain about Body development and maintenance: Amino acids, minerals, trace elements, vitamins and fatty acids respond to the basic nutritional needs for the development maintenance of the body. 3. Discuss about current situation of malnutrition and what their remedy are. 4. Discuss about protection of food.	1. Introduction 2. Classification of foods 3. Carbohydrates, Proteins, fats, minerals, vitamins 4. Mal-nutrition 5. Food security and food hygiene	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 6: Health care delivery system	**Theory: 22 Hrs**	**Lab/Practical: 5 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Discuss about the strategies and indicators to address the national health policy. 2. Discuss about the types of health care system, primary, secondary and tertiary health care. 3. Explain about health planning and management to prevent and promote health.	1. National health policy 2. Concept of healthcare 3. Health system 4. Levels of healthcare 5. Concept of health planning and management 6. Millennium Development Goal(MDG)	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Practical		
a) Observation of health care delivery system in Nepal at different level health institutions.		
Performance Objectives:	**List of Tasks:**	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 7: Waste disposal system	**Theory: 12 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Discuss about the type of waste like solid, liquid and hazardous waste and management of waste by 3R concept. 2. Discuss the important method of waste disposal. 3. Explain about the concept about latrine used in the community, chain of infection and method of excreta disposal. 4. Discuss about the hospital waste, its management and situation and problem of hospital waste management in Nepal. 5. Discuss the goals and objectives of national HWCM planning.	1. Introduction and types of waste like solid, liquid and hazardous waste and management of waste by 3R concept. 2. Important method of waste disposal. 3. Concept about latrine used in the community, chain of infection and method of excreta disposal. 4. Details about hospital waste, its management and situation and problem of hospital waste management in Nepal. 5. Goals and objectives of national HWCM planning.	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	
Unit 8: Medical and professional ethics	**Theory: 8 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Discuss the Ethical dimensions of professionalism, Moral trust society and best ows on professionals to act for the common good 2. Discuss about the Ethical dimensions of public health enterprise	1. Introduction to ethics 2. Medical ethics 3. Professional ethics 4. Principles of ethics 5. National professional ethics	
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.	

Unit 9: Introduction to Biostatistics	**Theory: 6 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After completion of the course, students should be able to: 1. Describe the roles biostatistics serves in public health and biomedical research;	1. Definition of biostatistics 2. Application of biostatistics	

2. Explain general principles of study design and its implications for valid inference when, for example, identifying risk factors for disease, isolating targets for prevention, and assessing the effectiveness of one or more interventions; 3. Assess data sources and data quality for the purpose of selecting appropriate data for specific research questions.	3. Measure of central tendency 4. Measure of dispersion
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.
Unit 10: Research	**Theory: 3 Hrs**
Theory	
Enabling Objectives:	**Content:**
After completion of the course, students should be able to: 1. Find out the new generalization of health related matter with old data. 2. Discuss about health related information trust. 3. Discuss the types of research should be conducted and which method should be applied.	1. Introduction 2. Types of research 3. Methods of research
Evaluation methods: written exam, viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Classroom instruction, handouts, Slides-ppt presentations, textbooks.

Reference Books: Use APA Format

- *Basic Principles of Management - Shrestha, B.M.Akshyulak Publication, Nepal. 2039B.S.*
- *Modern Management Methods and the Organization of Health Services, Public Health Papers #55. WHO. 1974.*
- *Inventory Control and Basic Logistics Procedure Manual on Store Management for PHC/HP and SHP Personnel. HMG/JSI. 2054B.S.*
- *Textbook of Preventive and Social Medicine - Park, K. B. Bhanot, Jabalpur, India. 2000.*
- *Health Logistics Procedure Manual. - NHTC/LMD/USAID JSI, Nepal 2057.*
- *Health Statistics and EPI Cold Chain Management Procedure Manual.-NHTC/LMD/USAID JSI, Nepal 2057.*
- *A Handbook of Hygiene and Public Health - Y.P. Bedi.*
- *Jorcan's Tropical Hygiene and Sanitation - W. Wilinte et.al.*
- *W.H.O. Excreta disposal*
- *Environmental Health and Sanitation - Shatrughna Ojha.*
- *Annual Report of Department of Health Services, Ministry of Health*
- *WHO Publications (related issues) - WHO, Geneva*
- *Laboratory Bio-safety Manual - WHO Publication, Geneva*
- *Text book of Health Education - Hari Bhakta Pradhan; Educational Resource for Health, Kathmandu, 1997.*
- *A Text Book of Health Education, - L. Ramachandran and T Dharmalingam, Vikas Publishing House Pvt. Ltd., New Delhi, 2001*
- *Text Book of Health Education – A Process of Human Effectiveness - David Bedworth& Albert Bedworth, Harper and Row, NY, 1978*
- *A Text Book of Health Education A Diagnostic Approach, Lowerence Green.*
- *Theory and Practice of Health Education - Helen S. Ross and Paul R. Mico, Mayfield Publishing Company, 1980*
- *Ottawa Charter, 1986 and Jakarta Declaration on Health Promotion in the 21st Century, 1997*
- *Introduction to Health Education - Water H. Green and Bruce G. Simons- Morton, Macmillan Publishing Company, NY*
- *World Health Report - 2002, Reducing Risk Promoting Healthy Life - World Health Organization Geneva, 2002.*
- *Quarterly, annual and special Publications of the International Union for Health Education and Health Promotion and Victoria Health Foundation*

First Aid/ Primary Health Care / MCH

Total Hours: 117	**Total Marks: 75**
Theory: 78 Hrs	**Theory : 50 (Internal: 10 + Final: 40)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course provides knowledge and skills on First aid, Primary health care and, Maternal and child health. This course deals on various cases of shock, poisoning cases, wound, burn and other common cases which need immediate attention. This course also acquaints trainees with the prevailing National health policy and strategy. Additionally, it will deal with the fundamental aspect of maternal and child Health care.

Course Objectives:

After successfully completing this course the student will be able to:

1. Provide emergency First aid to the needy,
2. Identify the National health policy and strategy, Health care delivery system, Elements of primary health care, Indicators of improvement in the health care and the role of health worker in primary health care.
3. Provide basic Maternal and child health care, and Family planning guidance to the needy.

Course Contents:

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.1: Introduction of First aid	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Define and describe the aims and principles of first aid, and the roles and responsibility of the first aider. 2. Explain the action to be taken during emergency. 3. Assess patient using the ABCDE method. 4. Explain the action to be taken for transfer of the patient.	1. Aims and principles of first aid 2. Explanation of the four steps of the First Ai Action Plan (assess, plan, implement, evaluate) 3. Roles, Responsibilities and qualities of first aider. 4. Procedures for assessment (ABCDE methods of assessment) and intervention in First aid.	
Evaluation methods: Written and viva exams (Short question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual	
Practical		
Performance Objectives:	**List of Tasks:**	
1. State the circumstances requiring First aid 2. Perform ABCDE assessment.	Rehearsal and observation on : 1. Checking patient's Airway and Breathing, Performing a quick scan,	

3. Explain the roles and responsibilities	Checking and controlling major problem. 2. Assessing for Disability and any Environmental threats
Evaluation methods: Performance observation in real or simulated settings.	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.2: Fainting and Shock	**Theory: 3 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Explain Fainting and Shock. 2. Explain the causes, types, sign and symptoms and complications of Shock. 3. Explain significance of recording Vital signs. 4. Describe first aid management to the patient in Fainting and Shock 5. Discuss indications for immediate transfer of the patient to a higher level facility center.	1. Definition of Fainting and Shock 2. Types and causes of Shock: Anaphylactic, Septic, Cardiogenic, Hypovolemic, Neurogenic. 3. Signs and symptoms of each types of shock. 4. Methods of recording Vital signs 5. First aid management of Fainting and Shock.	
Evaluation methods: Written and viva exams (Short and long question answer).	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Conduct the appropriate treatments for Shock in order to stabilize the person. 2. Perform vital sign recording. 3. Perform immediate assessment of patient in fainting and shock	1. Review topic summary before the activity. 2. Review the signs and symptoms of Fainting and Shock. 3. Demonstration of the steps for first aid for a person who is Fainted or Shocked. 4. Explain that students to role play (as a Patient, First aider and Evaluator) the first aid steps for fainting and shock dividing students into small groups. 5. Practice Recording pulse, Blood pressure, body temperature, respiration pattern and rate. 6. Rehearse treatment procedure and immediate management.	
Evaluation methods: Performance observation in real or simulated settings.	**Teaching / Learning Activities / Resources:** Classroom demonstration, Return demonstration, Models, Videos, Role play	

Unit 1. First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit :1.3 Poisoning	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Describe insecticides poisoning, Rodenticides poisoning and drugs and Alcohol poisoning. 2. Identify Poisoning and First aid measures. 3. Discuss prevention of poisoning.	1. Definition, Causes, Sign symptoms, Risk, Antidotes, Management and Prevention of each types of poisoning (Organophosphorus, Corrosive, petroleum products, Zink phosphide, Diazepam, Alcohol, Drugs) 2. Common poisonings in Nepal 3. Prevention of poisoning	
Evaluation methods: Written and viva exams (Short and long question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Identify common Insecticides, Rodenticides, Alcohol and Drugs causing poisoning in Nepal. 2. Identify the cause of poisoning. 3. Perform immediate management for poisoning.	1. Review topic summary before the activity. 2. Observe samples of Insecticides. 3. Observe Rodenticides 4. Observe Drugs and Alcohol 5. Role play within a group to identify the cause and treatment of poisoning according to clinical features.	
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, , videos, Role play,	

Unit 1m: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.4: Cardiopulmonary Resuscitation (CPR)	**Theory: 2 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Identify the conditions which require CPR.. 2. Discuss about the significance of oxygenation to the body and brain. 3. Describe the steps in assessment and intervention for the adult with respiratory arrest and cardiac arrest or both. 4. Explain and apply the difference between CPR procedure for Adult, Child and infant.	1. Define CPR 2. Principles of CPR 3. Conditions which require CPR. 4. Process of CPR 5. Precaution to be taken while performing CPR. 6. Procedure of CPR in children and infant.s	

Evaluation methods: Written and viva exams (Short question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.
Practical	
Performance Objectives:	**List of Tasks:**
1. Explain about Airway obstruction and cardiac arrest 2. Perform CPR immediately 3. Provide first aid assessment 4. Identify referral cases	1. Review topic summary before the activity. 2. Demonstrate the First Aid steps of CPR for adults, infants and children. 3. Divide all students into small groups and Role play to perform steps by steps CPR. 4. Make sure that everyone has enough time to practice. 5. Provide comments and feedback after practices.
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play

Unit : First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.5: Foreign body in Ear, Nose, Throat & Eye	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Identify foreign body in Ear, Nose, Throat and Eye. 2. Explain about first aid treatment appropriately in each case. 3. Discuss about the indications for immediate referral to a higher level facility center. 4. Describe and perform the Heimlich maneuver.	1. Common causes, Sign and symptoms, and Risks of foreign body in Ear, Nose, Throat and Eye. 2. Foreign body Removal techniques. 3. Indications for immediate referral. 4. DO'S and DONT'S in foreign body in Ear , Nose, and Throat 5. Heimlich maneuver	
Evaluation methods: Written and viva exams (Short question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Discuss and locate foreign body. 2. Explain about techniques of removal of foreign body. 3. Identify referral cases.	1. Review topic summary before the activity. 2. Divide participants into groups of people. 3. Explain that they will practice what to do when a person has a foreign object in the Eyes, Ears, Nose, and Throat.	

	4. Start role play, Rehearse to identify, locate and removal techniques of foreign body in each organ described. 5. Make sure that each participant has an opportunity to play the role of the First aider, Patient and Evaluator. 6. Continue role playing a variety of scenarios connected to the topics 7. Find out referral cases. 8. Provide comments and feedback after practices.
Evaluation methods: performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.6: Injury/Wound	**Theory: 1 Hr**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Classify and Describe different types of wound/injury. 2. Describe appropriate management of all types of wound/injury. 3. Discuss about types of bandaging. 4. Describe procedures for controlling haemorrhage from wound. 5. Discuss process of wound healing. 6. Describe factors delaying wound healing.	1. Definition and types of Closed and Open wound. 2. Recommended first aid treatment of each types of wound: (Abrasions, Incised, Contusions, Haematoma, Lacerations, Punctured/ stab, Perforating/Gun shoot).. 3. First aid assessment and treatment of injury/wounds. 4. Techniques of bandaging. 5. Complications of wounds. 6. Process of wound healing 7. Factors delaying wound healing and factors promote in wound healings.	
Evaluation methods: Written and viva exams (Short and long question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Identify types of wound. 2. Perform appropriate treatment of each types of wound. 3. Perform Hemorrhage control using appropriate technique.	1. Review topic summary before the activity. 2. Demonstrate the First Aid steps for each types of the wound. 3. Divide participants into small groups of people to Role play.	

4. Perform bandaging. 5. Identify and manage referrals.	4. Allow each group member to do each role (as a Patient, First aider and Evaluator) by rotating among themselves. • Observe wounded patient and classify. • Perform haemorrhage control techniques. • Observe and demonstrate types of bandage and select appropriate bandage for bandaging. • Demonstrate bandaging techniques. • Prescribe appropriate treatment for each types of wound. 5. Provide comments and feedback after practices.
Evaluation methods: Performance observation in real or simulated setting.	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.7: Haemorrhage	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Define haemorrhage and Classify different types of hemorrhage. 2. Identify measures to provide first aid to arrest external hemorrhage. 3. Describe the appropriate interventions for severe hemorrhage. . 4. Describe the precautions on transporting a haemorrhagic patient.	1. Definition and types of Haemorrhages. 2. Sign and Symptoms of haemorrhage. 3. First Aid management of haemorrhage. 4. Complication of haemorrhage.	
Evaluation methods: Written and viva exams (Short and long question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Identify haemorrhagic patient. 2. Demonstrate the steps for haemorrhage control. 3. Identify symptoms of severe haemorrhage and take appropriate action. 4. Manage transportation of haemorrhagic patient.	1. Review topic summary before the activity. 2. Be sure to explain the “DONTs” when treating bleeding (especially the use of tourniquets). 3. Divide all participants into small groups to Role role play as a patient, first aider and Evaluater). 4. Present the different scenarios of victims	

	for each group to practice. • Identify tpes of haemorrhage • Discuss about treatment. • Perform haemorrhage control techniques. • Apply bandaging. • Discuss about sign and symptoms of haemorrhagic patient who require immediate referral appropriately. 5. Provide comments and feedback after practices.
Evaluation methods: Performance observation in real or simulated setting.	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.8 Burn and Scald	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Explain and Classify burns. 2. Discuss about the characteristics of 1st, 2nd and 3rd degree burns. 3. Explain the extent of burns by the "rule of nines." 4. Describe the treatments and management of Burn and Scald.. 5. Describe how to estimate prognosis by burn depth and extent. 6. Describe indications for fluid therapy, and type of fluid therapy required for selected burn cases. 7. Describe indications for referral to a higher level facility.	1. Definition of Burn and Scald 2. Common causes, Classification, Sign and symptoms, and Complications of burns. 3. First aid assessment and treatment of burns and scalds. 4. Application of the "Rule of nines" to estimate extent of burn. 5. Fluid therapy for burn victims. 6. Pain management for burn victim. 7. Referral after stabilization of burn.	
Evaluation methods: Written and viva exams (Short and long question answer)	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Identify types of burn. 2. Apply bandaging and perform first aid treatment 3. Calculate burn percentage using Wallace's rule of nine.	1. Review topic summary before the activity. 2. Divide all participants into small groups to role play as a patient, first aider and Evaluator). 3. Ask for volunteers to do separate role play	

4. Identify severity of burn and manage accordingly. 5. Mention significance of rehydration in burnt patient. 6. Rescue of burnt patient from fire location.	in different scenarios: Scald from hot water, Burn from fire, and Scald from acid. 4. After each scene, encourage students to ask questions and answer if any they may have. 5. Ask the students to role play about: Differentiate Burn and scald. Severity of burn, Classify the burn, Management of burnt patient, Calculation of the extent of burn using Wallace's rule of nine. Practice of bandaging procedures, Practice Rescuing of victims, Manage referrals. 6. Provide comments and feedback after practices.
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.9: Heat stroke (Heat reaction)	**Theory: 1 Hr**	**Lab/Practical: 1 Hr**

Theory

Enabling Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Discuss about heat stroke, its appropriate first aid and immediate management. 2. Describe the signs and symptoms of heat reaction 3. Describe indications that need immediate referral to a higher level facility is necessary. 4. Explain how community education can prevent occurrences of Heat reaction and ensure a safe recovery.	1. Definition cause, Clinical features and of heat stroke. 2. Definition of Heat cramps, Heat exhaustion and Heat stroke. 3. Emergency treatment of Heat exhaustion and Heat stroke. 4. Prevention of Heat illness.
Evaluation methods: written and viva exams, performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.

Practical

Performance Objectives:	**List of Tasks:**
1. Perform first aid to heat reaction victim.	1. Review topic summary before the activity. 2.Role play by students.
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.10: Mountain sickness (Altitude sickness) /Hypothermia/Frost bite	**Theory: 2 Hrs**	**Lab/Practical: 1 Hr**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Describe the signs and symptoms of Altitude sickness, Hypothermia and Frost bite and their first aid management. 2. State examples of when persons might be at risk for Altitude sickness 3. Describe indications that immediate referral to a higher level facility is necessary. 4. Explain how community education can prevent occurrences of Altitude sickness, Hypothermia and Frostbite.	1. Definition, clinical features, first aid management and prevention of a. altitude illnesses b. Acute Mountain Sickness (AMS), c. High Altitude Cerebral Edema (HACE) d. High Altitude Pulmonary Edema (HAPE), e. Frost bite. 2. Process of Acclimatization	
Evaluation methods: written and viva exams, performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.	
Practical		
Performance Objectives:	**List of Tasks:**	
1. Conduct appropriate management of each case.	1. Review topic summary before the activity. 2. Role play by students.	
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,	

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.11 Fracture and Dislocation	**Theory: 7 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Define Fracture and dislocation and apply appropriate first aid technique. 2. Explain the signs and symptoms of Strain, Sprain, Fracture, and Dislocation 3. Define RICE (Rest, Immobilize, Cold, and Elevate) and describe its use. 4. Describe the long-term care for injuries to bones and joints. 5. Explain the preventive measures for bone and joint injuries including open and closed	1. Define sprain, Fracture, Subluxation and dislocation. 2. Causes, Signs and symptoms, and complications of Muscle injury, Fracture, Subluxation and Dislocation. 3. Types and pattern of Fracture 4. Splinting techniques for Fractures 5. Uses of RICE (Rest, Immobilize, Cold and Elevate) technique. 6. Emergency treatment, including the use of	

fracture. 6. Describe measures to immobilize the neck and spine. 7. Explain why all fractures should be referred to a higher level facility for further management	improvisation for Strains and sprains, Fractures, and Dislocations. 7. Prevention of bone and joint injuries. 8. Referral management.
Evaluation methods: written and viva exams	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.
Practical	
Performance Objectives:	**List of Tasks:**
1. Perform splinting and bandaging 2. Demonstrate lifting and transporting technique a patient who must remain immobile.	1. Review topic summary before the activity. 2. One by one student Role play as a person who has a fractured bone/ dislocation. 3. Demonstrate how to assess the injury. 4. State the steps for First aid and demonstrate the process of first aid. 5. Demonstrate how to immobilize the bone with a splint/ reduction of joint/Dislocation. 6. Discuss what you would do differently if it was other bones/joints. 7. Briefly discuss long term care for injuries to bones and joints.
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 1: First Aid	**Theory: 32 Hrs**	**Lab/Practical: 22 Hrs**
Sub-unit 1.12: Rabid Animal bite, Snake bite, and Insect stings	**Theory: 3 Hrs**	**Lab/Practical: 2 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Explain the incidence of injury and dangers of Animal bite, Snake bite and Insect stings. 2. Explain the pathophysiology, types of snake poison, sign and symptoms, and emergency management of poisonous snake bites. 3. Explain Aetilogy, Reservoir, and Mode of transmission, Incubation period of rabies and management of suspected rabid animal bites.	1. Explain the dangers of Animal bites and insect stings. 2. Incidence of injury due to snake bites, animal bites, Insect stings and poisoning. 3. Types of Snake poison (Neuro-toxic and Hemato-toxic), Sign and symptoms, and emergency Management of poisonous snake bites.	

4. Discuss common Insect bites, Complications, and Management. 5. Describe the appropriate first aid management for cases of Animal bites, Stings or Pois**o**ning. 6. Describe indications that the casualty should be removed to a higher level medical facility immediately. 7. Discuss prevention and control of rabies in animal and human population including vaccinations. 8. Discuss ways to reduce the incidence of Bites, Stings and Poisonings through community education	4. Methods of diagnosis of snake bites 5. Aetilogy, Reservoir, and Mode of transmission, Incubation period of rabies and management of suspected rabid animal bites. 6. Prevention and control of rabies in animal and human population including vaccinations (Pre exposure and Post exposure). 7. Common insect (Wasp, Hornet and Bee) bites, complications (including laryngeal oedema), and management.\ 8. ways to reduce the incidence of Bites, Stings and Poisonings through community education
Evaluation methods: written and viva exams	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self reading and learning, First Aid Manual.
Practical	
Performance Objectives:	**List of Tasks:**
1. Identify rabid animal 2. Identify poisonous and non-poisonous snake. 3. Perform first aid treatment. 4. Apply preventive measures. 5. Referral management	1. Review topic summary before the activity. 2. Briefly describe about bites and stings. 3. Divide students into groups of people for role play. 4. Explain that each group will prepare a role play of how to provide First Aid for the bite or sting. 5. Allow enough time to each group to plan and practice their role play.
Evaluation methods: Performance observation in real or simulated settings	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos, Role play,

Unit 2: Primary Health Care (PHC)	**Theory: 11 Hrs**	
Sub-unit 2.1: Concept and Determinants of Health	**Theory: 5 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Define health as given by WHO. 2. Explain the physical, mental and social dimensions of health. 3. Define the concept of PHC given by the Alma –	1. Concept of health given by WHO. 2. Physical mental and social dimensions of health.. 3. Major Health Indicators	

Ata declaration. 4. Mention essential health care service.. 5. Describe Principles , elements and strategy of PHC 6. Enumerate the scopes and indicators of health care. 7. List determinants of health by category. 8. State definitions of the levels of health care:	4. Determinants of health. 5. Scope of health care: Promotive, Preventive, Curative and Rehabilitation 6. Levels of disease prevention with examples 7. Relationship between Health for All and Primary Health Care. 8. Concept of PHC 9. Define PHC. Explain the principle , strategy, and element of PHC. 10. Scope of PHC
Evaluation methods: Written and Viva exams (Short answer questions)	**Teaching / Learning Activities / Resources:** Classroom instruction, Instructor led discussion, Textbook self-study, Related charts and handouts

Unit 2: Primary Health Care	**Theory: 11 Hrs**	
Sub-unit 2.2:National Health care policy	**Theory: 6 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Describe the National health policy and Health care delivery system. 2. Describe the components of National Health Policy 2070. 3. Describe the current periodic health services plan. 4. Identify National health strategy for fulfilling basic minimum health needs. 5. Identify the objectives, targets and activities of national health programmes	1. National health policy, and Health care delivery system of Nepal 2. Objective, Targets and Components of National Health Policy 2070. 3. Targets and coverage of different periodic health service plans. 4. National Health strategy. 5. Objectives, targets and activities of National health programs including: Child health Program, Nutrition Program, Family Health Program, Disease Control and Supportive Programs (National Health Education, Information and communication-NHEICC), Introduction of FCHV(Female Community Health Volunteer) and PHC/ORC (Primary Health Care/Outreach Clinic) program	
Evaluation methods: Written and Viva exams (Short answer questions)	**Teaching / Learning Activities / Resources:** Classroom instruction, Instructor led discussion, Textbook self-study, Related charts and handouts	

Unit 3: Maternal and Child Health	**Theory: 35 Hrs Practical: 16 Hrs**
Sub-unit 3.1: Introduction of Maternal and Child Health	**Theory: 3 Hrs**
Objectives:	Content:
After successfully completing this sub-unit the student will be able to: 1. Define Maternal and Child Health (MCH) 2. List the scope of MCH 3. Explain why mother and baby are treated as one unit. 4. Explain Antenatal, Intranatal and postnatal MCH services. 5. Identify High risk mothers and high risk children in community.	1. Definition and scope of MCH 2. Essential MCH services. 3. Antenatal, Intranatal and Postnatal care 4. High risk pregnancy, 5. Newborn care
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts
Unit 3: Maternal and Child Health	**Theory: 35 Hrs Practical: 16 Hrs**
Sub-unit 3.2: Safe motherhood	**Theory: 2 Hrs**
Objectives:	Content:
After successfully completing this sub-unit the student will be able to: 1. Discuss the purpose of Safe Motherhood Program. 2. Describe antenatal and delivery care provided at the basic health level, that recommended by national maternity care guidelines. 3. Describe essential new born care recommended by national maternity care guidelines. 4. Describe postnatal care recommended by National maternity care guidelines.	1. Safe motherhood programme 2. Scope of Maternity care. 3. Antenatal, Intranatal, postnatal and new born care at Basic level health care centres as recommended by national maternity care guidelines. 4. Elements of safe motherhood
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts
Unit 3: Maternal and Child Health	**Theory: 35 Hrs Practical: 16 Hrs**
Sub-unit 3.3: Reproductive Health	**Theory: 2 Hrs**
Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Discuss the concept and scope of Reproductive health	1. Concept and scope of Reproductive health. 2. Activities of reproductive health at

2. Describe the integrated reproductive health package. 3. Describe the details of intervention and activities of the National Reproductive Health Package at community health service level.	community health care level. 3. Terminologies: - couple protection rate / couple year protection, target couple, reproductive age group, eligible couple,.
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts

Unit 3: Maternal and Child Health	**Theory: 35 Hrs** **Practical: 16 Hrs**
Sub-unit 3.4: Child growth and development	**Theory: 1 Hr** **Practical: 2 Hrs**
Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Describe growth and development of a child 2. Identify assessments of growth by using growth monitoring charts. 3. Interpret growth chart recommended by Child Health Division.	1. Assessment of growth and development. 2. Growth monitoring techniques 3. Interpretation of growth monitoring charts.
Evaluation methods: written examinations, practical skill observation, viva	**Teaching / Learning Activities / Resources:** Classroom instruction, Instructor led discussion, Textbook self-study, related Charts and Handouts, Class room practical about growth chart, Arm tape, etc.
Unit 3: Maternal and Child Health	**Theory: 35 Hrs** **Practical: 16 Hrs**
Sub-unit 3.5: Infant feeding :Breast feeding	**Theory: 2 Hrs** **Practical: 1 Hr**
Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Explain about the advantages of breast feeding and disadvantages of bottle feeding 2. Define exclusive breast feeding. 3. Explain the benefits of colostrum feeding. 4. List common problems related to breast feeding. 5. Describe frequency and duration of breast feeding. 6. Explain alternatives of breast feeding.	1. Advantages of breast feeding. 2. Disadvantages of bottle feeding 3. Benefits of exclusive breast feeding. 4. Management of common problems related to breast feeding. 5. Recommendations regarding the frequency and duration of breast feeding. 6. Composition of breast milk 7. Alternatives of breast feeding: formula feeding, animal feeding. 8. Cup feeding (Expressed Breast Milk)
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts, role play

Unit 3: Maternal and Child Health	**Theory: 32 Hrs** **Practical: 16 Hrs**
Sub-unit 3.6: Infant feeding: Weaning	**Theory: 4 Hrs** **Practical: 2 Hrs**
Objectives:	**Content**:
After successfully completing this sub-unit the student will be able to: 1. Define weaning. 2. Describe the process of weaning. 3. Describe preparation of the weaning recipes. 4. List common problems related to weaning	1. Definition of weaning. 2. Age and process of weaning 3. Preparation and frequency of feeding weaning recipes from locally available foods: Sarbottam pitho, 4. Problem relating to weaning
Evaluation methods: written examinations, Practical observation, viva	**Teaching / Learning Activities / Resources:** Classroom instruction, instructor led discussion, textbook self-study, related charts and handouts, Demonstration weaning recipes.
Unit 3: Maternal and Child Health	**Theory: 32 Hrs** **Practical: 16 Hrs**
Sub-unit 3.7: Immunization	**Theory: 2 Hrs** **Practical: 4 Hrs**
Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Define immunization/vaccination and discuss the significance of immunization in disease prevention. 2. Explain the National Immunization Schedule. 3. Discuss the doses and routes of administration of vaccines recommended by EPI programme. 4. Discuss adverse effects following immunization and the management of these. 5. Outline recommended vaccine storage time and temperature at district and site-center. 6. Describe the principles and purpose of the "Cold Chain" procedure.	1. Definition of immunization /vaccination. 2. Advantage of immunization. 3. National Immunization schedule. 4. Doses, route of administration and common adverse effects of vaccine. 5. Cold Chain methods and its importance 6. Cause, sign and symptoms, complications, treatment management and prevention of Six killer diseases and common vaccine preventable diseases: Diphtheria, Pertusis, Tetanus, Tuberculosis, Measles, Poliomyelitis, Viral hepatitis, Japanese encephalitis, Pneumococcal Pneumonia
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** Classroom instruction, Instructor led discussion, textbook self-study, related charts and handouts, Demonstrations

UNIT 3: Maternal and Child Health (MCH)	**Theory: 32 Hrs**	**Lab/Practical: 16 Hrs**
Sub-unit :3.8 Childhood Diarrhoea	**Theory: 2 Hrs**	**Lab/Practical: 3 Hrs**
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Explain causes of childhood Diarrhoea in Nepal.	1. Definition, Causes and Clinical features of mild, moderate and severe diarrhea, and Dehydration,	

2. List the Signs and symptoms of diarrhea and dehydration. 3. Describe the recommended immediate treatment. 4. Identify the cases that may require immediate referral to a higher level facility center. 5. Explain how community education can prevent Diarrhea and Dehydration	2. Treatment of Diarrhoea and Dehydration 3. Oral rehydration salt. 4. Preventive measures of Diarrhea and Dehydration.
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts, Demonstrations

Unit 3: Maternal and Child Health (MCH))	**Theory: 32 Hrs**	**Lab/Practical 16 Hrs**
Sub-unit :3.9 Acute respiratory problems in children	**Theory: 3 Hrs**	
Theory		
Enabling Objectives:	**Content:**	
After successfully completing this sub-unit the student will be able to: 1. Identify acute respiratory infection. 2. Describe management of acute respiratory infection.	1. Definition, causes, mode of transmission classification sign and symptoms of 2. Acute respiratory infections. 3. Treatment and preventive measures of acute respiratory infection in children. 4. Current status of acute respiratory problems in Nepal	
Evaluation methods: written examinations, viva	**Teaching / Learning Activities / Resources:** classroom instruction, instructor led discussion, textbook self-study, related charts and handouts, demonstrations	

Unit 3: Maternal and Child Health	**Theory: 32 Hrs** **Practical: 16 Hrs**
Sub-unit 3.10: Family Planning (Introduction)	**Theory: 9 Hrs** **Practical: 5 Hrs**
Enabling Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. State the definition of family planning and the scope of family planning services. 2. Discuss the various rights of the client who seeks family planning counselling. 3. Explain individual and community health benefits of family planning including child-women's health 4. Calculate the current statistics for contraceptive prevalence rate (CPR) in Nepal.	1. Definition of family planning 2. Scope of family planning services. 3. Eligible couples 4. Relationship between family planning and improved MCH. 5. Classifications of contraceptive methods. 6. Different categories of contraceptive methods available in Nepal:

5. Explain the chief differences between the commonly used contraceptive methods 6. List examples of birth spacing and terminal methods. .	• **Temporary methods**: Barrier, IUCD, Hormonal, Miscellaneous. • **Permanent methods**: Vasectomy, Laparoscopy (Minilap), Tubectomy
Evaluation methods: written examination, viva	**Teaching Learning Activities / Resources:** classroom instruction, teacher led discussion, text book self-study, charts
Unit 3: Maternal and Child Health	**Theory: 32 Hrs** **Practical: 16 Hrs**
Sub-unit 3.11: Family planning (Postpartum contraception)	**Theory: 2 Hrs**
Enabling Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Describe the reliability and duration of postpartum temporary infertility. 2. Identify the situation when a lactating woman should begin using additional protection. 3. Describe the effects of using the COCs on lactation. 4. Discuss the effectiveness and return of fertility with the locational amenorrhoea.	1. Postpartum Temporary infertility. 2. Contraception for breastfeeding women. 3. Locational amenorrhoea method. 4. COCs on lactation.
Evaluation methods: written examination, viva	**Teaching Learning Activities / Resources:** Classroom instruction, Teacher led discussion, Text book self-study, Charts
Unit 3: Maternal and Child Health	**Theory: 32 Hrs** **Practical: 16 Hrs**
Sub-unit 3.12: Family planning (Emergency contraception)	**Theory: 3 Hrs**
Enabling Objectives:	**Content:**
After successfully completing this sub-unit the student will be able to: 1. Describe aims, types, eligibility, clinical procedure, client instructions and common side effects of emergency contraception with COCs and other hormonal methods. 2. Discuss how the current legal rulings regarding termination of unwanted pregnancy apply to the role of Health worker.	1. Types, Eligibility, Procedure, Mode of action, Client instructions and Common side effects of emergency contraception with COCs and other Hormonal methods. 2. Factors affecting the use of emergency contraception by COCs. 3. Management of emergency contraception. 4. Current laws pertaining to termination of unwanted pregnancy.
Evaluation methods: written examination, viva	**Teaching Learning Activities / Resources:** classroom instruction, teacher led discussion, text book self-study, charts

Reference Books:

- *St. John Ambulance UK (2016), First Aid, 10th edition*
- *International Committee of the Red Cross (2006), Switzerland*
- *Prof. Dr. Anjani Kumar Sharma and Prof. Dr. Sunil Kumar Sharma (2015), Principles of Surgery , 4th edition, Makalu publication house, Kathmandu*
- *K Park (2017), Park's Textbook of Prevenssssstive and Social Medicine, 24th edition Banarsidas Bhanot Publishers, India*
- *Department of Health Services, Ministry of Health, Annual Reports*
- *WHO Publications (related issues) - WHO, Geneva*
- *Maurice King, Felicity King, and WHO at al (2009), Primary child care: A manual for health workers, 2nd edition, Oxford MacMillan Publishers Ltd.*
- *N.Yalayyaswamy (2011), First Aid and Emergency Nursing, 1st edition CBS Publisher & Distributors P Ltd.*

Reference Books: Use APA Format

- *First Aid - St. John Ambulance*
- *First Aid - ICRC*
- *Principles of surgery - Dr. Anjani Kumar Sharma*
- *Park's Textbook of Preventive and Social Medicine - K Park*
- *Annual Report - Department of Health Services, Ministry of Health*
- *WHO Publications (related issues) - WHO, Geneva*
- *Primary Child Care - M King*
- *First Aid and Emergency Nursing - N N.Yalayyaswamy*
- *Emergency first AID safety oriented - arvinder popli, Nirmal*

Third Year

Subjects

1. Radiographic Pathology
2. Hospital Practice & Patient Care
3. Radiography Practical I
4. Radiography Practical II

Basic Radiographic Pathology

Total Hours: 117	**Total Marks: 75**
Theory: 78	**Theory: 50 (Internal: 10 + Final: 40)**
Practical: 39	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:

This course introduces, pathological terminology related to radiological science. Student will be able to understand clinical history the diagnostic process applied to the particular indication and imaging modalities to particular organ system.

Course Objectives:

On completion of the course the learner will be able to:

1. Identify the etiologies, pathology and clinical features of common systemic disorders and communicable diseases.
2. Identify indications that a case requires consultation to a higher level or specialty facility.
3. Identify indication and contraindication for radiological procedure.

Unit 1: Introduction to Common pathological Terminology	**Theory : 12 Hrs**	**Practical : 6 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Discuss various pathological terminologies and their clinical and radiological manifestation.	1. Traumatic Pathology – Fracture, Dislocation, Subluxation, Hemorrhage, Sprain 2. Tumor-Benign and Malignant 3. Infective Pathology- Tuberculosis, Arthritis 4. Infection, Inflammation and Infestation	
Evaluation methods: Evaluation methods: written exam with short answer question.	**Teaching / Learning Activities / Resources:** classroom instruction, Imaging films Charts, Diagrams supervised clinical practice	
Practical 6 hours		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, students will able to: 1. Identify Normal radiograph 2. Identify common pathology in Radiograph.	1. Recognize normal radiograph 2. Recognize common fracture in Radiograph. 3. demonstrate common pathology	
Evaluation methods: viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** Hospital posting, Clinical demonstration, research journal.	

Unit 2: Chest	Theory : 22 Hrs	Practical : 11 Hrs
Theory		
Enabling Objectives:	**Content:**	
1. Introduce common pathology of chest	1. Pneumonia, lung abscess, Tuberculosis, COPD, Ca Lung, Medistinal mass, Atelactasis, foreign bodies, emphysema, Pneumothorax, Haemothorax, pleural effusion, Cardiomegaly, CTR, Dextrocardia, common fracture in chest cavity, breast cancer	
Evaluation methods: written exams (short answer questions)	**Teaching / Learning Activities / Resources:** Classroom instruction, field visit, Radiograph review. Group discussion.	
Practical 11 hours		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, students will able to: 1. Identify Normal radiograph 2. Identify common pathology in Radiograph.	1. Identify Normal radiograph of Lung and Mediastinum 2. Identify common pathology in Radiograph like PTB, Cardiomegaly, Pneumothrox, Pleural effusion, Dextrocardia etc	
Evaluation methods: Pathology identification, Viva exam and Practical performance.	**Teaching / Learning Activities / Resources:** Radiographic Films, View box, Cases reports, Research Article, Different Internal devices like ET tube, catheter.	

Unit 3: Bones and joints	Theory: 22 Hrs	Practical : 6 Hrs
Theory		
Enabling Objectives:	**Content:**	
1. Introduce common pathology of Bone and joints 2. Introduce common pathology of Spine	1. Review of Fracture- , Dislocation, Subluxation of common bones and joints. 2. Arthritis, Degenerative joint disease, Osteomyelitis. Osteoporosis, Gout, Paget's disease. 3. Lordosis, scoliosis, Kyphosis, Spondylosis and spondylolisthesis. 4. Bone Tumor and bone metastasis.	
Evaluation methods: written exams (short answer questions)	**Teaching / Learning Activities / Resources:** Classroom instruction, field visit, Radiograph review. Group discussion.	
Practical		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, students will able to: 1. Identify Normal radiograph 2. Identify common pathology in Radiograph.	1. Recognize Normal radiograph of Abdomen and Pelvis. 2. Recognize common pathology in Radiograph like Fracture, dislocation, Spondylolisthesis, Osteomyelitis. Osteoporosis, Gout, Paget's disease. Lordosis, scoliosis, Kyphosis, Spondylosis	

	and spondylolisthesis. 3. Bone Tumor and bone metastasis.
Evaluation methods: Pathology identification, Viva exam and Practical performance.	**Teaching / Learning Activities / Resources:** Radiographic Films, View box, Cases reports , Research Article, Different Internal devices like ET tube, catheter.

Unit 4: Abdomen and Pelvis	**Theory : 22 Hrs**	**Practical : 10 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Introduce common pathology of Abdomen and Pelvis	1. Acute abdomen condition, Ascities, Perforation, Bowel obstruction, TOF, Ca Stomach, Crohn's disease, Intussusception, Volvulus, Ca Colon, TB intestine 2. Haematuria, UTI, Nephrilithasis, Urolithasis, Ectopic Kidney, Horseshoe kidney, Hydronephrosis, cystitis, Veseco-ureteric reflux, pyelonephritis, Diveticula, urethral stricture, Renal failure 3. Infertility, Ca ovary, ectopic pregnancy	
Evaluation methods: written exams (short answer questions)	**Teaching / Learning Activities / Resources:** Classroom instruction, field visit, Radiograph review. Group discussion.	

Practical: 10 hours	
Performance Objectives:	**List of Tasks:**
In radiography skill lab, students will able to: 1. Identify Normal radiograph 2. Identify common pathology in Radiograph.	1. Recognize Normal radiograph of Abdomen and Pelvis 2. Recognize common pathology in Radiograph like Acute Abdominal Condition, Calculus, Intestinal obstruction, Perforation, Ectopic kidney. Urethral stricture, Reflux and Tubal Blockage.
Evaluation methods: Pathology identification, Viva exam and Practical performance.	**Teaching / Learning Activities / Resources:** Radiographic Films, View box, Cases reports , Research Article, Different Internal devices like ET tube, catheter.

Recommended Texts:

1. *Kowalczyak Nina Radiographic pathology for Technologist 6th edition.*
2. *Ronald L. Eisenberg, Nancy M Johnson. Comprehensive radiographic pathology Elseiver 6th edition.*

Reference Books:

1. *Martensen KM Radiographic image analysis Elseiver 4th edition.*
2. *Edwards, C.R.W. and Bouchier, I.A.D., Davidson's Principles and Practice of Medicine. Churchill Livingstone, London. Current edition.*

Hospital Practice & Patient Care

Total Hours: 117 Hrs	**Total Marks: 75**
Theory: 78 Hrs	**Theory: 50 (Internal: 10 + Final: 40)**
Practical: 39 Hrs	**Practical: 25 (Internal: 10 + Final: 15)**

Course Description:
This course provides the students with knowledge of general hospital practice and patients care with regard to the patients coming to Radiology department and in bedside Radiography. This course also provides knowledge of Medico-legal aspects and Code of Practices in radiography

Course Objectives:
On the completion of the course, the learner will be able to:

1. Apply patient care in Radiography.
2. Apply attitude &communication skill in patient care.
3. Transfer patient & maintain their positioning.
4. Explain medical ethics and medico-legal aspect, code of ethics and code of practice applicable to radiography practice and patient care.

Unit 1: Patient care in Radiology	**Theory: 28 Hrs**	**Lab/Practical: 17 Hrs**
Sub-unit 1.1: Introduction of Patient care	**Theory: 15 Hrs**	
Enabling Objectives:	**Content:**	
1. Define Patient care. 2. To know about Airway, Breathing and Circulation (ABC). 3. To know about Vital signs 4. To know about consent.	1. Definition of patient care 2. Meaning of ABC 3. Vital signs- BP, Pulse Rate, Respiratory rate and Temperature 4. Informed and written consent.	
Evaluation methods: written and viva exams, performance observation in real or simulated settings.	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self-reading and learning, Manual. Teaching / Learning Activities**.**	

Sub-unit 1.2: Bedside radiography	**Theory: 13 Hrs**
Enabling Objectives:	**Contents:**
1. Define bedside radiography 2. Define traction 3. Describe factors consider during ward radiography	4. Introduction of bedside radiography 5. Different types of tractions 6. Factors: • Control of infection • Handling of patient • Radiation Protection • Handling of x-ray equipment and its accessories. • Communication skills
Evaluation methods: written and viva exams, performance observation in real or simulated settings.	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self-reading and learning, Manual. Teaching / Learning Activities**.**

Practical: 17 hours	
Performance Objectives:	**List of Tasks:**
In radiography skill lab, students will able to: 1. Measure Vital signs 2. Fill consent form 3. Observe ABC and Traction 4. Handle equipment independently	1. Measure Vital signs- - BP - Pulse Rate - Respiratory Rate - Temperature 2. Fill consent form. 3. ABC 4. Traction 5.Independent handling of equipment.
Evaluation methods: Performance observation in real or simulated settings**.**	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos & clinical postings.

Unit 2: Safety, Transfer, Positioning & Communication	**Theory: 22 Hrs**	**Lab/Practical : 8 Hrs**
Theory		
Enabling Objectives:	**Content:**	
1. Define work place safety. 2. Define different methods of patient transfer. 3. To know patient positioning for safety and comfort. 4. Define communication skill in different specific age and in special circumstances.	1. Work place safety. 2. Patient Transfer. a)Preparation for transfer b)Stretcher transfer c)Wheelchair transfer 3. Positioning for safety and comfort a) Body positions b) Support and padding c) Restrains and immobilization 4. Age specific care and communication 5. Communication in special circumstances.	
Evaluation methods: written and viva exams, performance observation in real or simulated settings**.**	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self-reading and learning, Manual Teaching.	
Practical: 8 Hrs		
Performance Objectives:	**List of Tasks:**	
In radiography skill lab, students will able to: a. Perform different types of patient transfer. b. Use patient restrainer & immobilization devices. c. Recognize work place safety d. Demonstrate different communication skills	a. Demonstrate different types of patient transfer device. b. Involving students in different types of patient transfer. **c.** Demonstrating patient restrainer & immobilization devices. **d.** Demonstrate the skill of work place safety **e.** Demonstrate different communication skills	
Evaluation methods: Performance observation in real or simulated settings**.**	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos**,** involves concern activities.	

Unit 3: Standard ethics for Radiographer	Theory: 28 Hrs	Practical: 14 Hrs
Theory		
Enabling Objectives:	**Content:**	
1. Define medical ethics & medico legal issues. 2. Define role of radiographer in work place. 3. Define code of ethics. 4. Define professional practice.	1. Describe Medical ethics and medico legal issues, breach of professional confidence, negligence. 2. Role of radiographer in work place. 3. Code of ethics 4. Scope of professional practice.	
Evaluation methods: written and viva exams, performance observation in real or simulated settings.	**Teaching / Learning Activities / Resources:** Classroom instruction/lecture, Self-reading and learning, Manual Teaching	

Practical: 14 Hrs	
Performance Objectives:	**List of Tasks:**
In radiography skill lab, students will able to: 1. Recognize medical ethics & medico legal issues. 2. Recognize role of radiographer in work place. 3. Recognize code of ethics. 4. Perform professional practice.	1. Recognize medical ethics & medico legal issues. 2. Recognize role of radiographer in work place. 3. Recognize code of ethics. 4. Perform professional practice.
Evaluation methods: Performance observation in real or simulated settings**.**	**Teaching / Learning Activities / Resources:** Demonstration, Return demonstration, Models, Videos**,** involves concern activities.

Reference Books:

1. *Chesney: Patient care and Practice.*
2. *Patient care in Radiography with introduction to Medical Imaging, Ruth Ann Ehrlich & Joan A. Daly*
3. *Preventive & Community Medicine, J. Park*

Radiography Practical I

Total Hours: 900 Hrs (24 Hrs/Week)	Total Marks: 600 (240 Internal + 360 Final)

Course Description:
This field experience comprehensive clinical practical program is designed to help students apply the knowledge and skills on actual situation supervised by trained professionals. The program is offered after completing second year.

Course Objectives:
On the completion of the course, the students will be able to:

1. Fill up the request forms and carry out registration process
2. Perform routine and supplementary radiographic techniques for upper and lower limbs, thoracic cage, abdomen, spine and skull
3. Apply modified techniques for various disabilities and type of subject.
4. Perform radiation protection and practical methods of reducing dose to the patient.

Course Outline

Unit 1: Introduction to radiographic technique	**Practical: 20 Hrs**
Performance Objectives:	**List of Tasks:**
1. Practice and demonstrate anatomical, radiographic positioning terminologies. 2. Practice the process of work drill of radiographers. 3. Observe the steps of registration of patients. 4. Observe different filing system used in radiology department	1. Observe and perform all the anatomic positioning techniques and projections; supine, prone ,erect, medial, lateral, flexion, extension, cranial, caudal, proximal, distal, oblique, decubitus etc 2. Recognise the radiographic work drill, radiographic request forms, and radiographic examination log register. 3. Recognise patient identification- x-ray no., Hospital number, patients name, bill no.
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Unit 2: Radiographic technique for extremities	**Practical : 400 Hrs**
Sub-unit 2.1: Radiographic techniques for lower limb	**Practical : 200 Hrs**
Performance Objectives:	**List of Tasks:**
1. Perform all the routine radiographic examination of lower limb. 2. Perform supplementary projections for foreign body, weight bearing, intercondylar projections, skyline view of patella and tibial tuberosity.	1. Explain the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of toes, foot,

	calcaneum, ankle , tibia , fibula, knee, femur ,hip joint, neck of femur and pelvis 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and essential image criteria.
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Sub-unit 2.2: Radiographic techniques for upper limb	**Practical : 200 Hrs**
Performance Objectives:	**List of Tasks:**
1. Perform all the routine radiographic examination of upper limb. 2. Perform supplementary projections for scaphoid, carpal tunnel, ball catchers projections, head of radius, supracondylar fracture and olecranon process	1. Explain and instruct the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of fingers, thumb, hand, wrist, forearm, elbow and humerus. 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and essential image Criteria.
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Unit 3: Radiographic technique for shoulder girdle and clavicle	**Practical : 60 Hrs**
Performance Objectives:	**List of Tasks:**
1. Perform all the routine radiographic examination 2. Perform supplementary projections for the axial projection of clavicle, bicipital groove, coracoid process.	1. Explain and instruct the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of Shoulder joint, scapula, acromio-clavicular joint, clavicle, sternoclavicular joint, sternum and ribs.. 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and

	essential image Criteria
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Unit 4: radiographic technique for pelvic girdle and hip region	**Practical : 60 Hrs**
Performance Objectives:	**List of Tasks:**
1. Perform all the routine radiographic examination for Pelvis and hip. 2. Perform Frogs leg projection, ischeum, symphysis pubis, acetabulum and congenital dislocation of hip.	1. Explain and instruct the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of the whole pelvis, sacro-iliac joints, hip joint and neck of femur. 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and essential image Criteria
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Unit 5: Radiographic Technique for Vertebral Column	**Practical : 80 Hrs**
Performance Objectives:	**List of Tasks:**
1. Perform all the routine radiographic examination of Vertebral column. 2. Perform supplementary projections for. Intervertebral foramina, flexion and extension of cervical spine , scoliosis and kyphosis.	1. Explain and instruct the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of atlanto-occipital joint , cervical spine, cervico-thoracic junction , thoracic spine, lumbar spine , sacrum and coccyx 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and essential image Criteria.
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Unit 6: Radiographic Technique for Chest and Abdomen	**Practical : 200 Hrs**
Performance Objectives:	**List of Tasks:**
1. Perform all the routine radiographic examination of Chest 2. Perform all the routine radiographic examination of Abdomen. 3. Perform supplementary projections for. Opaque swallow, thoracoic inlet, soft tissue neck .apical view and lordotic view, decubitus and pediatric cases. 4. -Supplementary projection for acute abdomen	1. Explain and instruct the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of Chest, Abdomen and Pelvis 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and essential image Criteria.
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Unit 7: Radiographic Technique for Skull	**Practical : 80 Hrs**
Performance Objectives:	**List of Tasks:**
1. Identify the anatomical landmarks of skull 2. Perform all the routine radiographic examination of cranium and facial bones 3. Perform supplementary projections for trauma, towne's method, sellaturcica, optic formina, temporal bones and mastoids. 4. Perform routine projections of PNS 5. Observe and perform dental radiography.	1. Explain and instruct the patient for patient preparation, including removal of radiopaque materials. 2. Ask for last menstruation period (LMP) of female patient of reproductive age and apply 10 day rule. 3. Prepare the equipment and set the appropriate exposure factors for examination of cranium, facial, PNS, mandible 4. Apply radiation protection rules to reduce the dose to the patient and obtain a radiograph 5. Check the radiographs for any artifacts and essential image Criteria.
Evaluation methods: logbook duty signed by the supervisor. Practical and oral examination	**Teaching / Learning Activities / Resources:** clinical posting in radiology department and case study

Note:

- Students should be present in the departments at least 90% of the allotted days to be eligible to sit in the final examination.
- Students will have to perform all examinations under the supervision of departmental staffs and may be allowed to perform examinations independently if the supervisor finds them perfect.
- Students should keep their practical record (**log-book**) signed periodically by their supervisor/demonstrator at the end of the posting in each subject.

Reference Books:

1. *Merill's Atlas of Radiographic Positioning and Diagnostic Procedure, Volume I & II – Philip W Ballinge*
2. *Manual of Radiographic Technique - T. Holm. PES. Palmer,*
3. *Text book of Radiology technicians - Satish K. Bhargava*
4. *Manual of Radiographic Technique - T. Holm. PES. Palmer,*
5. *Clark's positioning in radiography.*

Radiography Practical II

Total Hours: 375 hrs (10 Hrs / Week)	Total Marks: 250 (100 Internal + 150 Final)

Course Description:

This course is designed to help students apply the comprehensive knowledge and skills on actual situation supervised by competent and trained professionals. The program is offered after completing second year. During this period student should acquire practical knowledge to be able to independently handle the some of the cases and be able to assist specialists on special radiographic procedures.

Course Objectives:

On the completion of the course, the learner will be able to:

1. Perform some of the Radiological investigations and assist Radiological technologist / Radiologist during special radiographic procedure with/ without the use of contrast media.
2. Handle portable and mobile X - rays machines with absolute precision.
3. Handle CR and Direct digital radiography
4. Select contrast media according to specific examination.
5. Identify adverse contrast media reactions and its management.

Course Contents:

Unit 1: Radiographic investigation of gastro-intestinal tract using contrast media		**Lab/Practical: 120 Hrs**
Practical		
Performance Objectives:	**List of Tasks:**	
Student will be able to: 1. Prepare the patient for Barium Series examination. 2. Assist the procedure under supervision of Radiological Technologist/ Radiologist. 3. Take films necessary for procedure.	1. Explain the patient about Barium series. 2. Check for the patient preparation and necessary equipment. 3. Check brief medical history of the patient. 4. Look for any absolute contraindication. 5. Take informed written Consent for procedure. 6. Prepare the barium contrast media of different concentration. 7. Take the necessary exposures at accurate timing 8. Describe about aftercare and complication.	
Evaluation methods: viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** supervised clinical practice**.**	
Unit 2: Radiographic investigation of Uro-genital tract using contrast media		**Lab/Practical: 125 Hrs**
Practical		
Performance Objectives:	**List of Tasks:**	
1. Student will be able to 2. Prepare the patient for Uro-genital tract examination. 3. Assist the procedure under supervision of Radiological Technologist/ Radiologist.	1. Explain the patient about Uro-genital tract examination. 2. Check for the patient preparation and necessary equipment. 3. Check brief medical history of the patient.	

4. Take films necessary for procedure.	4. Look for any absolute contraindication. 5. Take informed written Consent for procedure. 6. Prepare contrast media of different examination. 7. Take the necessary exposures at accurate timing 8. Describe about aftercare and complication.
Evaluation methods: viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** supervised clinical practice**.**

Unit 3: Radiographic investigation of Biliary tract & Vascular tract using contrast media		**Lab/Practical: 50 Hrs**
Practical		
Performance Objectives:	**List of Tasks:**	
1. Student will be able to 2. Prepare the patient for Biliary tract and vascular examination. 3. Assist the procedure under supervision of Radiological Technologist/ Radiologist. 4. Take films necessary for procedure.	1. Explain the patient about biliary tract and vascular examination. 2. Check for the patient preparation and necessary equipment. 3. Check brief medical history of the patient. 4. Look for any absolute contraindication. 5. Take informed written Consent for procedure. 6. Prepare contrast media of different examination. 7. Take the necessary exposures at accurate timing 8. Describe about aftercare and complication.	
Evaluation methods: viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** supervised clinical practice**.**	

Unit 4: Other Radiographic investigation using contrast media		**Lab/Practical: 80 Hrs**
Sailogram, DCG, Myelogram, Arthrography, Mammography and Ward Radiography		
Practical		
Performance Objectives:	**List of Tasks:**	
1. Student will be able to 2. Prepare the patient for other special investigation. 3. Assist the procedure under supervision of Radiological Technologist/ Radiologist. 4. Take films necessary for procedure.	1. Explain the patient about other special investigation. 2. Check for the patient preparation and necessary equipment. 3. Check brief medical history of the patient. 4. Look for any absolute contraindication. 5. Take informed written Consent for procedure. 6. Prepare contrast media of different examination. 7. Take the necessary exposures at accurate timing 8. Describe about aftercare and complication.	
Evaluation methods: viva, performance observation in clinical setting	**Teaching / Learning Activities / Resources:** supervised clinical practice**.**	

Note:

- Students should be present in the departments at least 90% of the allotted days to be eligible to sit in the final examination.
- Students will have to perform all examinations under the supervision of departmental staffs and may be allowed to perform examinations independently if the supervisor finds them perfect.
- Students should keep their practical record (**log-book**) signed periodically by their supervisor/ demonstrator at the end of the posting in each subject.

Evaluation Scheme:

- Under this scheme students will have to perform a prescribed number of examinations in each department and maintain a logbook duly signed by the supervisor. At the end of the term the teacher or supervisor closely evaluates their performance for accuracy and precision according to the evaluation sheet proposed. At the end of the course there will be a final practical and oral examination.

Reference Books:

- *Chapman &Nakielny's Guide to Radiological Procedures6th Edition by Nick Watson*
- *A guide to radiological procedure -Stephen Chapman and Richard Nakielny, Fifth edition.*
- *Radiographic Photography & Technique II- NiranjanThapa; Heritage Publication; 2016*
- *Merill's Atlas of Radiographic Positioning and Diagnostic Procedure, Volume I & II – Philip W Ballinge*
- Textbook Of radiology For Residents & Technicians 5ed *by S. K*Bhargava.
- Radiological Procedures - A Guideline - Bhushan N. Lakhkar