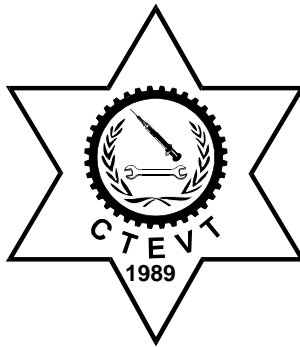


Curriculum
for
CERTIFICATE
in
DIAGNOSTIC RADIOGRAPHY
(CDR)
(Second and Third years)



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

First Revision, 2010

(Revision initiative taken by NHPC in collaboration with WHO)

1. Programme Description

This course is based on the job required to perform by a Radiographer at different level health institutions in Nepal and abroad. The program is of three years' duration. The first year course focuses on basic science and foundational subjects, the second year course focuses on basic radiography and imaging subjects and the third year is given to the application of learned skills and knowledge within the comprehensive practical settings in hospital recognized by ministry of health or concerned government authority.

2. Program aims and objectives

The course aims to produce middle level radiography and imaging manpower with sound academic knowledge equipped with perfect technical skills, which can face real life situation at different level of hospitals and related institutions.

At the end of the course, the student should able to:

- Perform all routine radiography/and assist in special x-ray examination
- Maintain photographic and x-ray equipment in good working order
- Possess knowledge on recent advances in imaging technology.
- Protect the patients and staff from possible radiation hazards and make sure that the patients and staff do not receive unnecessary radiation.
- Maintain records of x-ray examinations, filing of radiographs & ordering of necessary radiographic supplies.
- Provide care of the patients whilst in the x-ray dept.
- Prepare radiography set up required for routine and special investigations.
- Set up primary health centre and district level radiography clinic.
- Practice quality control system in radiology department to deliver quality reports.
- Familiarise middle level radiography management works, supervision of subordinates and preparation of reports.
- Assist in research works (basic concept about research).

3. Target group

SLC pass youths

4. Group size

30 (maximum) in a batch

5. Entry criteria

- SLC with 50% in aggregate with English, Science and Mathematics as compulsory subjects.
- Passed entrance examination conducted by CTEVT
- Applicant should submit the following documents at the time of application
 - SLC pass certificate
 - Character certificate
 - Citizenship certificate (for the name, parents name, age, date of birth and address verification purpose only)
 - Physical fitness certificate (at the time of admission)
 - Student quota for different category of students as per the policy of CTEVT

6. Medium of instruction

- English
- Nepali

7. Course duration

The CDR program extends for three academic years. One academic year consists of 39 academic weeks and one academic week consists of 32 to 37 hours.

8. Pattern of attendance

Minimum of 90% attendance is required to appear in final examination.

9. Teacher and student ratio

- Overall all ratio of teacher and student must be 1:10 (at the institution level)
- Teacher and student ratio for practical demonstration
- 75% of the teachers must be fulltime.

10. Program coordinator, teacher and demonstrator

- The program coordinator must be a Master degree holder in Radiography related field or a bachelor degree holder in Radiography field with minimum 1 year experience in teaching activities
- The teacher must be a bachelor degree holder in radiography related field.
- The Instructor must have an intermediate level degree in related field with 5 years experience.
- For basic science subjects the teacher must have a master degree in concerned subjects.

11. Instructional Media and Materials

- **Printed Media Materials** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Textbooks etc.)
- **Non-projected Media Materials** (Display, Models, Flip chart, Poster, Writing board etc.)
- **Projected Media Materials** (Opaque projections, Overhead transparencies, Slides etc.)
- **Audio-Visual Materials** (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.)
- **Computer-Based Instructional Materials** (Computer-based training, Interactive video etc.)

12. Professional practice / Field visit provision

- Consists of 1 year duration at the end of the course
- Student must complete all the first and second year subjects to appear in the final examination
- Professional practice (Field practice) should be conducted in a hospital recognised by Ministry of Health or Concerned government authority.
- Provision of at least one teacher in the institution where field visit is conducted- either from the concerned institute or the hospital/centre itself

13. Teaching learning methodology

The methods of teachings in the CDR programme will be a combination of several approaches. Such approaches can be Illustrated Lecture, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Laboratory, Observation, Hospital visit, Term paper presentation, Case analysis, Tutoring, Role playing, Heuristic and Other Independent learning.

- Theory: Lecture, Discussion, Assignment, Group work
- Practical: Demonstration, observation and Self practice,

14. Disciplinary and ethical requirements

Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by review by the disciplinary review committee of the school.

Dishonesty in academic or practice activities will result in immediate suspension followed by administrative review, with possible expulsion.

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

15. Method of evaluation

1. Internal assessment

- There shall be a transparent evaluation system for each subject both in theory and practical
- Internal assessment every 4 month with feedback to the student
- Clinical assessment with formative evaluation system
- Internal assessment carries 20% of the total marks

2. Final Examination: Written exam, Practical exam and Viva voce

- Weightage of theory and practical marks will be according to the course structure
- Final exam carries 80% of the total marks
- Must pass internal assessment exams (both theory and practical) to appear in the final examination

- Provision of re-examination as per CTEVT policy.
- Provision for administering practical examination by qualified Radiological Technologist.
- One examiner in one setting can evaluate not more than 20 students per day for final practical examination
- Practical examination should be administered in actual situation on relevant subject with provision of at least one independent external examiner from the concerned recognized teaching institute.

16. Pass marks

- 40% in theory examination
- 60% in practical examination

17. Grading system

- Pass division: 40% or above
- First division: 65% or above
- Distinction: 80% or above

18. Certificate award

The council for technical education and vocational training will award "**Certificate Level in Diagnostic Radiography**" to the candidate who successfully completes the requirements as prescribed by the council.

19. Career path

The graduates will be eligible for the position equivalent to Non-gazetted 1st class (technical) as Radiographer or as prescribed by the Public Service Commission. The graduate is eligible for registration with the Nepal Health Professional Council in the grade as mentioned in the Nepal Health Professional Council Act.

Course structure of Certificate in Diagnostic Radiography

First year

S.No.	Subject	Mode		Weekly Hours	Distribution of Marks						Total Marks
		T	P		Theory			Practical			
					Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1	English	3	-	3	20	80	3	-	-	-	100
2	Nepali	3	-	3	20	80	3	-	-	-	100
3	Social Studies	3	-	3	10	40	3	-	-	-	50
4	Anatomy & Physiology	3	2	5	16	64	3	8	12	3	100
5	Physics	3	1	4	16	64	3	8	12	3	100
6	Chemistry	3	2	5	16	64	3	8	12	3	100
7	Zoology	3	2	5	16	64	3	8	12	3	100
8	Botany	3	1	4	16	64	3	8	12	3	100
9	Mathematics, Statistics & Computer Application	3	2	5	16	64	3	8	12	3	100
	Total	27	10	37	146	584		48	72		850

Second year

S.No.	Subject	Mode		Weekly Hours	Distribution of Marks						Total Marks
		T	P		Theory			Practical			
					Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1.	Radiography technique I	3	2	5	24	96	3	12	18	3	150
2.	Radiography technique II	3	2	5	24	96	3	12	18	3	150
3.	Radiographic photography	2	2	4	20	80	3	-	-	-	100
4.	Radiographic equipment	3	2	5	20	80	3	-	-	-	100
5.	Radiation physics	3	1	4	20	80	3	-	-	-	100
6.	Radiological Anatomy	2	1	3	8	32	1.5	4	6	2	50
7.	Basic Public Health	4	2	4	16	64	3	8	12	3	100
8.	First aid/PHC/MCH	2	1	3	8	32	1.5	4	6	2	50
	Total	22	14	36	148	592		44	66		800

Third year

S.No.	Subject	Mode		Weekly Hours	Distribution of Marks						Total Marks
		T	P		Theory			Practical			
					Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1.	Clinical Radiology		2	2					50		50
2.	Radiography Practical I		24	24				100	400		500
3.	Radiography Practical II		8	8				60	240		300
	Total		34	34				160	690		850

*Details on the distribution of marks for field practice evaluation are mentioned in the Field Practice section of the curriculum.

Second Year

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

Course description

This course provides knowledge and skills on routine and supplementary radiographic techniques. 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

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

1. Perform routine radiographic techniques for upper and lower limbs, thoracic cage and abdomen, spine and skull,
2. Perform supplementary views for the spine and pelvis, and skull,
3. Perform Tomography for the chest, kidney, gall bladder and skeletal system, and
4. Identify registration procedure for patients.

Course Content

THEORY

Unit 1 Introduction to Radiographic Technique (5 Hours)

- a) Define the radiographic positioning terminology.
- b) State the process of work drill of radiographers.
- c) Fill up the request forms.
- d) Practice some abbreviations and common medical terms.

Unit 2 Routine Radiography Technique for upper limb (20 Hours)

- a) Describe the process of all routine radiographic examination of upper limb including fingers, thumb, hand, wrist, forearm, elbow, humerus, shoulder, scapula and clavicle.
- b) Describe the examination of head of humerus & axial shoulder, acromio-clavicular joints, sternoclavicular joints and foreign body in the hand

Unit 3 Routine Radiography Technique for the lower limb (20 Hours)

- a) Describe the all routine radiographic examination of the lower limb including toes, foot, calcaneum, ankle, tibia, fibula, knee, femur, hip joint, neck of femur and pelvis.
- b) Describe the examination of foreign body in the foot, lateral foot, weight bearing, skyline view of Patella and tibial tuberosity

Unit 4 Routine Radiographic technique for thoracic cage and abdomen (20 Hours)

- a) Describe technique of all routine radiographic examinations of the thoracic cage including chest, heart, ribs and sternum.
- b) Describe the technique of plain & erect abdomen x-ray
- c) State the need for these x-rays
- d) Explain the supplementary views of the chest and abdomen including 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 and imperforated anus.
- e) State the purposes of these views

Unit 5 Routine technique for the spine (10 Hours)

- a) Describe all routine of radiography of the spines (cervical, thoracic, lumbar, sacrum and coccyx, sacro-iliac joint).

Unit 6 Supplementary views for the spine and pelvis (including soft tissue) (10 Hours)

- a) 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.

Unit 7 Routine technique for the skull (15 Hours)

- a) Define radiographic anatomical landmarks of the skull.
- b) Explain the process of routine examination of the bones of skull including cranium, face and mandible

Unit 8 Supplementary views for the skull (10 Hours)

- a) Explain the supplementary views for the skull including town's view, submento vertical, sella turcica, temporo-mandibular joint, nasal bones, paranasal sinuses, mastoids orbits, optic foramina, foreign body in the eye, and dental radiography.

Unit 9 Tomography (5 Hours)

- a) Define the basic principle of tomogram.
- b) Describe practical application of tomography for the chest, kidney, gall bladder and skeletal system.

Unit 10 Registration process (2 Hours)

- a) List the steps of registration of patients.
- b) State the importance of a monthly and annual record, filing system and prepare the proforma invoices.
- c) Filing of radiographs and reports (x-ray no., hospital number, patient's name, cross reference bill, with patient's name, etc).

PRACTICAL (On dummy patient without exposure)

Unit 1 Introduction to Radiographic Technique (5 Hours)

- a) Prepare a chart of work drill of radiographers.
- b) Observe different forms used in radiology departments
- c) Observe the steps of registration of patients.
- d) Observe monthly and annual record, filing system and prepare the proforma invoices.
- e) Observe radiographs and reports (x-ray no., hospital number, patient's name, cross reference bill, with patient's name, etc).
- f) Practice some abbreviations and common medical terms.

Unit 2 Routine Radiography Technique for upper limb (10 Hours)

- a) Perform all routine radiographic examination of upper limb including fingers, thumb, hand, wrist, forearm, elbow, humerus, shoulder, scapula and clavicle.
- b) Perform the examination of head of humerus & axial shoulder, acromio-clavicular joints, sterno-clavicular joints and foreign body in the hand

Unit 3 Routine Radiography Technique for the lower limb (10 Hours)

- a) Perform all routine radiographic examination of the lower limb including toes, foot, calcaneum, ankle, tibia, fibula, knee, femur, hip joint, neck of femur and pelvis.
- b) Perform the examination of foreign body in the foot, lateral foot, weight bearing, skyline view of Patella and tibial tuberosity

Unit 4 Routine Radiographic technique for thoracic cage and abdomen (10 Hours)

- a) Perform all routine radiographic examinations of the thoracic cage including chest, heart, ribs and sternum.
- b) Perform the supine & erect abdomen x-ray
- c) Perform the supplementary views of the chest and abdomen including 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 and imperforated anus.

Unit 5 Routine technique for the spine (10 Hours)

- a) Perform all routine of radiography of the spines (cervical, thoracic, lumbar, sacrum and coccyx, sacro-illiac joint).

Unit 6 Supplementary views for the spine and pelvis (including soft tissue) (9 Hours)

- a) Perform the supplementary vies 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.

Unit 7 Routine technique for the skull (10 Hours)

- a) Perform routine examination of the bones of skull including cranium, face and mandible

Unit 8 Supplementary views for the skull (9 Hours)

- a) Perform the supplementary views for the skull including town's view, submento vertical, sella turcica, temporo-mandibular joint, nasal bones, paranasal sinuses, mastoids orbits, optic foramina, foreign body in the eye..

Reference books

1. Clark's Positioning in Radiography -R. A. Swallow E. Naybr
2. Merrill's Atlas of Radiographic Positioning and Diagnostic Procedure, Volume I & II – Philip W Ballinger
3. Manual of Radiographic Technique - T. Holm. PES. Palmer,
4. Text book of Radiology technicians - Satish K. Bhargava

Program: CDR
Subject: Radiography Technique II

Hour per week: 5
Total hours: 195
Full marks: 150

Course description

This course provides knowledge and skills on specialised radiographic techniques. This course deals on radiographic investigation on gastro-intestinal tract using contrast media, urinary tract and hystero-salpinogram. This course deals with vascular and neurological examination and special examinations as well. Additionally, this course also describes about portable and mobile X-rays for radiographic examinations.

Course objectives

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

1. Perform and assist special radiographic procedures with the use of contrast media for examination of the alimentary, biliary, genito-urinary, vascular and neurological system, and
2. Handle portable and mobile X-rays.

Course Content

THEORY

Unit 1 Contrast media (12 Hours)

- a) Define the contrast media.
- b) List types of contrast media.
- c) Describe methods of introducing the contrast media.
- d) List reactions of contrast media.
- e) Identify name of the emergency equipments and drugs needed to cope with reactions.

Unit 2 Radiographic investigation of gastro-intestinal tract using contrast media (20 Hr)

- a) Describe indications, contraindications, preparation, technique and after care of the patient on the following procedures.
 - i) Barium Swallow.
 - ii) Barium Meal.
 - iii) Barium Follow through.
 - iv) Hypotonic duodenography.
 - v) Gastrographic examination of GI tract.
 - vi) Ba-enema.
 - vii) Small bowel enema.
 - viii) Loopogram.
- b) State the role of a radiographer during fluoroscopy.

Unit 3 Investigation of urinary tract and hystero-salpinogram (20 Hours)

- a) Describe indications, contraindication, preparation, technique and instructions to be given on the following procedures.
 - i) Intravenous Urogram (IVU).
 - ii) Cystogram.
 - iii) Micturating cystogram.
 - iv) Urethrogram.
 - v) Retrograde pyelogram.
 - vi) Hystero salpinogram (HSG)

Unit 4 Portable/mobile x-ray (15 Hours)

- a) List the uses of mobile machine.
- b) Describe the technique of using ward radiography.
- c) Describe the technique of using portable/mobile unit in operating theatre radiography.
- d) Identify technique to help in hip pinning.
- e) Describe the technique of operative-cholangiography.

Unit 5 Other special examinations (50 Hours)

- a) Describe indications, contraindication, preparation, technique and instructions to be given on the following procedures
 - i) Percutaneous transhepatic cholangiography and drainage (PTC and PTCD)
 - ii) Endoscopic retrograde cholangio pancreatography (ERCP).
 - iii) Operative cholangiography.
 - iv) T-tube cholangiography.
 - v) Carotid and vertebral angiogram.
 - vi) Femoral angiogram.
 - vii) Aortogram.
 - viii) Phlebogram.
 - ix) Myelogram.
 - x) Arthrogram.
 - xi) Dacrycystogram.
 - xii) Sinogram/Fistulogram.
 - xiii) Sialogram.
 - xiv) Mammogram.

Unit 6 Understand the procedure of:

- i) OCG
- ii) Bronchogram
- iii) Arthrogram
- iv) Macro-radiography
- v) Soft tissue radiography
- vi) High KV technique

PRACTICAL**Unit 1 Contrast media (10 Hours)**

- a) Identify the types of contrast media.
- b) Observe and perform methods of introducing the contrast media.
- c) Make a chart to manage reactions of contrast media.
- d) Observe and make a list of the emergency equipments and drugs needed to cope with reactions.

Unit 2 Radiographic investigation of gastro-intestinal tract using contrast media (14 Hrs)

- a) Observe the following procedures.
 - i) Barium Swallow.
 - ii) Barium Meal.
 - iii) Barium Follow through.
 - iv) Hypotonic duodenography.
 - v) Gastrographic examination of GI tract.
 - vi) Ba-enema.
 - vii) Small bowel enema.
 - viii) Loopogram.

Unit 3 Investigation of urinary tract and hystero-salpinogram (10 Hours)

- a) Observe the following procedures.
 - i) Intravenous Urogram (IVU).
 - ii) Cystogram.
 - iii) Micturating cystogram.
 - iv) Urethrogram.
 - v) Retrograde pyelogram.
 - vi) Hystero salpinogram (HSG)

Unit 4 Portable/mobile x-ray (12 Hours)

- a) Observe the technique of using ward radiography

Unit 5 Other special examinations (32 Hours)

- a) Observe the following procedure
 - i) Intravenous cholangiography (IVC)
 - ii) Percutaneous transhepatic cholangiography and drainage (PTC and PTCD)
 - iii) Endoscopic retrograde cholangio pancreatography (ERCP).
 - iv) Mammogram.
 - v) Lymphangiogram.
 - vi) Macro-radiography.
 - vii) Soft tissue radiography

Text books

- 1. Diagnostic Radiography - Glenda J. Bryan

Reference books

- 1. Clark's Positioning in Radiography -R. A. Swallow E. Naybr
- 2. Merrill's Atlas of Radiographic Positioning and Diagnostic Procedure, Volume I & II – Philip W Ballinge
- 3. Manual of Radiographic Technique - T. Holm. PES. Palmer,
- 4. Text book of Radiology technicians - Satish K. Bhargava

Course description

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

Course objectives

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

1. Handle photographic process involved in producing a radiograph.
2. Manage all the practical aspects of darkroom work in radiography using manual and automatic processing and to care for the darkroom equipment.
3. Recognize the more common photographic faults and be able to correct them.
4. Understands basic darkroom design and materials used to protect the darkroom from ionizing radiation.

Course Content

THEORY

Unit I Photographic process (12 Hours)

- a) X-ray film
 - i) Define x-ray film
 - ii) State characteristics of x-ray film.
 - iii) Explain construction of x-ray film.
 - iv) List types of x-ray film.
- b) Define spectral sensitivity.
- c) State film speed, contrast and density.
- d) Define sensitometry.
- e) Define characteristic curve.
- f) Identify production of the radiographic image.

Unit 2 Film Processing (15 Hours)

- a) Manual film processing (processing cycle)
 - i) Development: Describe constituents of developer, factors affecting control of development, developer replenisher, maintenance of activity and level of developer
 - ii) Rinsing
 - iii) Fixation: Describe constituents of fixer, factors affecting fixation and regeneration of the fixer.
 - iv) Washing Process
 - v) Drying Process
 - vi) Tanks and containers for processing chemicals, processing units.
 - vii) Mixing Chemicals.
 - viii) Storage of chemicals.
 - ix) Film hangers.
 - x) Advantage and disadvantages of manual processing
- b) Automatic Processor
 - i) State basic principle & its functioning.
 - ii) Advantage and disadvantages of automatic processing

Unit 3 Cassette and intensifying screens (15 Hours)

- a) Describe functions and design of cassettes.
- b) List types of cassette.
- c) List the process of cleaning of cassettes,
- d) State function and construction of intensifying screens.
- e) Identify the construction of screen speeds & sharpness.
- f) State the importance of choice of fluorescent materials, new phosphors.

- g) Describe the process of cleaning and mounting of intensifying screens and screen contact.

Unit 4 The x-ray dark room (15 Hours)

- a) List situation lay out of dark room.
- b) State the location and importance in the dark room.
- c) Construction of walls, floor & ceilings.
- d) Radiation protection.
- e) Ventilation.
- f) Light tight entrances.
- g) Illumination.
- h) Safe lights.
- i) Cassette hatches.
- j) Loading bench.
- k) Dark room routine.
- l) Silver recovery

Unit 5 The radiographic Image (8 Hours)

- a) Identify the components of the radiography image including sharpness of image, radiographic contrast, exposure factors and resolution

Unit 6 Identification & Presentation of the radiograph (8 Hours)

- a) Describe methods of identifying the radiograph.
- b) Identify technique for presenting the radiograph for reporting with documents
- c) Identify viewing equipment and its conditions.

Unit 7 Storage of radiographs and x-ray materials (5 Hours)

- a) Describe ordering and storage of x-ray films
- b) Identify proper method for storage of chemical and film filing system.

PRACTICAL

Unit I Photographic process (12 Hours)

- a) Observe the identification of film speed, contrast and density.
- b) Observe the use of sensitometer.
- c) Construct a characteristic curve.

Unit 2 Film Processing (16 Hours)

- a) Prepare film processing chemicals (manual and automatic)
 - i) Development
 - ii) Rinsing
 - iii) Fixation
 - iv) Washing Processing
- v) Observe functioning of automatic processor

Unit 3 Cassette and intensifying screens (16 Hours)

- a) Observe the design of cassettes.
- b) Identify different types of cassette.
- c) Perform cleaning of cassettes,
- d) Observe intensifying screens.
- e) Observe the construction of screen speeds
- f) Perform cleaning and mounting of intensifying screens and screen contact.

Unit 4 The x-ray dark room (16 Hours)

- a) Make a chart showing situation and lay out of dark room.
- b) Observe the construction of walls, floor & ceilings including ventilation, light tight system, illumination, safe light, cassette hatches, load bench and location of processors.
- c) Observe the radiation protection measures in a dark room

- d) Observe the dark room routine and silver recovery.

Unit 5 The radiographic Image (6 Hours)

- a) Observe sharpness of image, radiographic contrast, exposure factors and resolution

Unit 6 Identification & Presentation of the radiograph (6 Hours)

- a) Identify different methods of film identification, different type of film markers
- b) Identify different type of film artifacts
- c) Perform the technique for presenting the radiograph for reporting with documents
- d) Observe viewing equipment and its conditions.

Unit 7 Storage of radiographs and x-ray materials (6 Hours)

- a) Perform ordering and storage of x-ray films
- b) Perform proper method for storage of chemical and film filing system.

Text books

1. Radiological & Imaging secrets - L.C. Gupta, and Abhitabh
2. Radiography Imaging - DN and MO Chesney
3. Manual of dark-room technique - P. E. S. Palmer

Reference books

1. Radiographic and dark-room procedures - L.C. Gupta, and Abhitabh

Program: CR
Subject: Radiographic Equipment

Hour per week: 5
Total hours: 195
Full marks: 100

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 photo-fluorographic equipment and Rapid serial radiographic equipment. Additionally this course focuses on control of scattered radiation.

Course objectives

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

1. Describe historical background of X-rays and its production,
2. Handle and Care various radiographic equipments,
3. Control scattered radiation, and
4. Familiarise with recent advances in imaging technology.

Course Content

THEORY

Unit 1 Historical background of x-rays and its production (17 Hours)

- a) Identify early x-ray tubes and its development.
- b) Differentiate stationary and rotating anode x-ray tube including basic designs, line focus principle and tube shielding.
- c) State recent advances in x-ray tube design including high speed rotating anode and choice of target angle.
- d) Describe the process of tube rating, cooling and care of x-ray tube and its faults.

Unit 2 Control panel, x-ray tables & tube column (15 Hours)

- a) State the process of exposure control
- b) Differentiate x-ray table and its type.
- c) Define x-ray tube support (ceiling & floor type).

Unit 3 Fluoroscopic equipment (15 Hours)

- a) Describe components, functioning and mechanism of
 - i) Fluorescent screen.
 - ii) Fluoroscopic image.
 - iii) Fluoroscopic table
 - iv) Image intensifier and TV monitoring
 - v) Radiation protection during fluoroscopy.

Unit 4 Control of scattered radiation (15 Hours)

- b) Describe components, functioning and mechanism of
 - i) Significance of scatter
 - ii) Beam limiting devices
 - iii) Beam centring devices
 - iv) Secondary radiation grid
 - v) Grid movement

Unit 5 Portable and mobile x-ray unit (15 Hours)

- c) Describe components, functioning and mechanism of
 - i) Portable/Mobile x-ray equipment
 - ii) Condenser discharge mobile units
 - iii) Mobile image intensifier for O. T.

Unit 6 Tomography and photo-fluorographic equipment (15 Hours)

- a) Describe the principles of tomography and its movement

- b) List the parts needed for tomography equipments.
- c) Describe the principles of Photo fluorographic equipment.

Unit 7 Rapid serial radiographic equipment (15 Hours)

- a) Describe various accessories used for angiographic examinations.
- b) Angiography table
- c) Cassette changer
 - i) Manual
 - ii) Automatic
- d) Automatic film changer: Cut and roll film changer
- e) Auto injector
- f) Program selector

Unit 8 Introduction to Modern Medical Imaging Modalities (10 Hours)

- a) Introduction, principle and uses of Digital Radiography, CT Scan and MRI,

PRACTICAL

Unit 1 X-rays and its production (11 Hours)

- a) Observe early x-ray tubes and newer ones including high speed rotating anode.
- b) Observe stationary and rotating anode x-ray.

Unit 2 Control panel, x-ray tables & tube column (8 Hours)

- a) Observe the exposure control
- b) Observe and differentiate x-ray tables.
- c) Observe x-ray tube support (ceiling & floor type).

Unit 3 Fluoroscopic equipment (9 Hours)

- a) Observe fluorescent screen.
- b) Observe fluoroscopic image.
- c) Observe fluoroscopic table with image intensification and TV monitoring
- d) Observe radiation protection measures taken.

Unit 4 Control of scattered radiation (10 Hours)

- a) Observe beam limiting devices, beam centring devices
- b) Observe grid movement and secondary radiation grid

Unit 5 Portable and mobile x-ray unit (10 Hours)

- a) Observe components and functioning mechanism of
 - i) Portable/Mobile x-ray equipment
 - ii) Condenser discharge mobile units
 - iii) Mobile image intensifier for O. T.

Unit 7 Rapid serial radiographic equipment (11 Hours)

- a) Observe various accessories used for angiographic examinations including angiography table, cassette changer (manual and automatic), automatic film changer, cut and roll film changer, auto injector and program selector

- a) Observe the uses of Digital Radiography, CT Scan and MRI,

Text books

1. Chesneys' equipment for student radiographers -Peter

Reference books

1. Physic and Equipment in imagine modalities- Stephanie Mass

Program: CR
Subject: Radiation Physics

Hour per week: 4
Total hours: 156
Full marks: 100

Course description

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

Course objectives

After successfully completing this course the student 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.

Course Content

THEORY

Unit 1 Electricity & x-ray apparatus (47 Hours)

- a) Static electricity
 - i) Explain elementary electron theory.
 - ii) Define electric charge, electric potential & capacity of a conductor.
 - iii) Explain the principle of capacitor (parallel plate only) & the factors, which affect the capacitance of a capacitor.
 - iv) Explain the concept dielectric.
 - v) Explain charging & discharging of a capacitor through a resistor.
 - vi) Explain series & parallel connections of the capacitors.
 - vii) Solve the simple numerical problems on capacitors.
- b) Current electricity
 - i) Explain magnetic effect of the electric current in the stationary & the moving conductors.
 - ii) Explain the magnetic field of a solenoid & an electromagnet.
 - iii) Describe the principle & construction of the moving coil meter.
 - iv) Explain electromagnetic induction & state its laws.
 - v) Explain the concepts of mutual & self induction.
 - vi) Define alternating current & state its advantage against direct current.
 - vii) Explain generation, frequency, losses from peak & effective values of alternating current.
 - viii) Classify the types of the current.
 - ix) Define transformer & state its types.
 - x) Explain construction, principle, losses, efficiency & regulation of a transformer.
 - xi) Define turns ratio, current ratio & voltage ratio & state their relation.
 - xii) Solve simple problems on transformer.
 - xiii) Differentiate low & high tension transformer.
 - xiv) Explain construction & principle of an autotransformer.
- c) Thermionic emission- tubes & valves
 - i) Explain thermionic emission, variation of electron emission with temperature
 - ii) Explain construction, principle & characteristics of a diode.
 - iii) Explain construction & principle of a cold cathode gas filled diode.
 - iv) Explain self rectified circuit & its disadvantage.
 - v) Explain the half-wave (two valve) & full wave (four valve bridge) circuits.
 - vi) State hazards of electric fire in the use of x-ray apparatus and explain the precautions to be taken against the hazards
 - vii) Describe the generator symmetry & its necessity in rectifier circuit
 - viii) Describe two types of measurement of high voltage
 - ix) Describe the main parts involved in x-ray generator with diagram
 - x) Describe the uses of x-ray cable fuses, switches, earthing & insulation

- xi) Perform the necessary wirings in switches & fuses.

Unit 2 Radiation physics (40 Hours)

- a) Define proton, electron, neutron mass number & atomic number.
- b) Explain energy level in an atom.
- c) Explain ionisation & excitation; isotopes & fundamental of radioactivity.
- d) Define electromagnetic radiation; explain the production of x-rays, characteristic & continuous spectrum of an electromagnetic radiation.
- e) Explain Inverse square law and solve simple problems
- f) Explain interaction of radiation with matter
- g) Define quality (half-value layer, effective photon energy) and intensity or quantity (exposure, roentgen) of an x-ray.
- h) Explain the factors influencing quality and intensity of an x-ray
- i) Describe the sequence of events how radiation is absorbed by a biological medium.
- j) Define attenuation, absorption & scattering of the radiation.
- k) Explain the exponential law.
- l) Define attenuation coefficients. Establish the relation between attenuation coefficient & half value layer, explain filtration & filters.
- m) Explain basis of x-ray & x-ray measurements; describe construction & working of a free air ionisation chamber, Thimble ionisation chamber and condenser ionisation chamber.
- n) Define radiation absorbed dose.
- o) Define ultrasound & its range. Explain piezo-electric effect. Describe the production, the detection & the uses of the ultrasound.

Unit 3 X-ray protection (30 Hours)

- a) Explain historical introduction or why the protection is necessary against the radiation.
- b) Define maximum permissible dose/Dose limits.
- c) Tabulate the recommended maximum permissible doses for the different parts of the body.
- d) Code of conduct in radiography practice.
- e) Identify the protective materials and lead impregnated substances & building material for ionizing radiation.
- f) Define lead equivalent & explain its variation with quality.
- g) Describe the necessity of personnel monitoring & monitoring instruments including film badge, ionisation chamber & thermo-luminescent dosimeter.
- h) Use basic techniques for diagnostic uses of x-rays to limit the exposure of the patients to minimum value & also to protect other persons from ionizing radiation.

PRACTICAL

Unit 1 Electricity & x-ray apparatus (15 Hours)

- a) Static electricity
 - i) Observe the use of capacitor (parallel plate only) & the factors, which affect the capacitance of a capacitor.
 - ii) Observe charging & discharging of a capacitor through a resistor.
 - iii) Solve the simple problems on capacitors.
- b) Current electricity
 - i) Observe magnetic effect of the electric current in the stationary & the moving conductor
 - ii) Observe the construction of the moving coil meter.
 - iii) Observe low & high tension transformers.
 - iv) Observe the construction of an autotransformer.
 - v) Solve simple problems on transformer.
- c) Thermionic emission- tubes & valves
 - i) Observe different types of diode.
 - ii) Observe self rectified circuit.
 - iii) Observe the half-wave & full wave circuits.

- iv) Observe types of measurement of high voltage
- v) Draw a diagram of x-ray generators
- vi) Observe x-ray cable fuses, switches, earthing & insulation including necessary wirings in switches & fuses.

Unit 2 Radiation physics (14 Hours)

- a) Construct spectrum of an electromagnetic radiation.
- b) Perform simple calculations of the exponential law.
- c) Observe different types of filters used in radiology department
- d) Observe the process of measuring radiation absorbed dose.
- e) Observe ultrasound and its components including accessories.

Unit 3 X-ray protection (10 Hours)

- a) Observe the protective materials and lead impregnated substances & building material for ionizing radiation.
- b) Observe personnel monitoring & monitoring instruments including film badge, ionisation chamber & thermo-luminescent dosimeter.

Text books

1. First Year Physics for Radiographer – George A Hay

Reference books

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

Course description

This course is designed to provide knowledge and skills on Radiological Anatomy in radiological perspective. This course includes of 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

Unit I Introduction (10 Hrs)

- a) Recall various important anatomical terminology: anterior, posterior, median, lateral, superior, inferior, proximal, distal, extension, flexion, abduction, adduction, sagittal, coronal, palmar, dorsal, ventral, rotation, crest, surface, oblique, apical, decubitus, and other important cross sectional anatomical terminology
- b) Name different systems in human body as a whole and their relationship.

Unit 2 Bones and Joints (14 Hrs)

- c) Recall border, canal, condyle, epicondyle, foramina, fossa, process, spine, surface, tubercle, trochanter.
- d) Classify, structure and functions of the following bones:
 - i) Cranial bones
 - ii) Facial bones and nasal sinus
 - iii) Teeth structure and eruption process.
- b) Describe the ossification and detailed anatomy of followings
 - i) Clavicle, scapula, humerus, ulna, radius, carpals, metacarpals and phalanges.
 - ii) Femur, tibia, fibula, tarsals, metatarsals and phalanges.
- c) Describe the bones of axial skeleton
- d) Define and classify joints
- e) Describe the process of movements of the following joints: shoulder, sterno-clavicular, elbow, wrist, knee, foot, ankle, sacroiliac, temporomandibular, intervertebral, interphalangeal, atlantooccipital

Unit 3 Muscular System

- a) Recall major muscles around major joints
- b) Recall some surface markings of some important muscles and their actions

Unit 4 Digestive system (5 Hrs)

- a) State size, shape, relationship and functions of the salivary glands, pharynx, oesophagus, stomach, liver, gall bladder, biliary tract, pancreas, small intestine, large intestine, rectum and anus.

Unit 5 Cardiovascular system (7 Hrs)

- a) Recall composition and functions of blood
- b) Describe structure, blood supply, nerve supply and function of the heart.
- c) Describe blood vessels: arteries, veins and capillaries
- d) Identify the major blood vessels in the body with surface marking.

Unit 6 Respiratory system (8 Hrs)

- a) Recall the functions of respiratory system
- b) State size, shape, relationship and functions of. naso-pharynx, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and pleura.

- c) Describe the structure of thoracic cage and diaphragm
- d) Describe the process of respiration
- e) Identify the outline of pleura and lungs with surface marking

Unit 7 Lymphatic system (2 Hrs)

- a) Describe the structure and functions of the lymphatic system.
- b) Identify important groups of lymph nodes

Unit 8 Urinary system (8 Hrs)

- a) State size, shape, relationship and functions of the organs associated with urinary system including kidney, ureter, urinary bladder and urethra
- b) Describe the process of formation of urine and its composition
- c) Describe mechanism of micturation
- d) Describe the surface marking of kidneys

Unit 9 Reproductive system (2 Hrs)

- a) State structure, shape, functions and relationship of the organs of male and female reproductive system.

Unit 10 Endocrine system (6 Hrs)

- a) Define hormone and its role in body homeostasis
- b) State structure, location, functions of Pituitary, Thyroid, Parathyroid, Pancreas, Suprarenal, Ovary, and Testis.
- c) State role of hypothalamus in endocrinal control system.

Unit 11 Nervous system (6 Hrs)

- a) Classify and enumerate the function of nervous system
- b) State structure, location and function of brain, spinal cord, spinal nerves, cranial nerves.
- c) State the structure and functions of autonomic nervous system and organs of special sense

Unit 12 Surface anatomy (6 Hrs)

- a) Identify the different organs on the body surface
- b) Identify the different bones of radiological importance in human body
- c) Identify the different land marks of radiological importance in human body

PRACTICAL

Unit 1 Introduction (5 Hrs)

- a) Identify anterior, posterior, median, lateral, superior, inferior, proximal, distal, extension, flexion, abduction, adduction, saggital, coronal, palmar, dorsal, ventral, rotation, crest, surface, oblique, apical, in human body

Unit 2 Bones and Joints (10 Hrs)

- a) Identify border, canal, condyle, epicondyle, foramina, fossa, process, spine, surface, tubercle, trochanter.
- b) Identify the parts of the following
 - i) Cranial bones
 - ii) Facial bones and nasal sinus
 - iii) Teeth structure and eruption process.
- c) Observe the ossification centres on the x-ray and determine the age of the child using these x-rays.
- d) Identify the parts
 - i) Clavicle, scapula, humerus, ulna, radius, carpals, metacarpals and phalanges.
 - ii) Femur, tibia, fibula, tarsals, rnetatarsals and phalanges.
- e) Identify joints in human body
- f) Observe the movements of the following joints: shoulder, sterno-clavivular, elbow, wrist, knee, foot, ankle, sacroiliac, temporomancibular, intervertebral, interphalangeal, atlantooccipital

Unit 3 Muscular system (2 Hrs)

- a) Identify major muscles around major joints
- b) Surface marking of some important muscle and their action

Unit 4 Digestive system (3 Hrs.)

- a) Identify the salivary glands, pharynx, oesophagus, stomach, liver, gall bladder, biliary tract, pancreas, small intestine, large intestine, rectum and anus.

Unit 5 Cardiovascular system (3 Hrs)

- a) Identify the different structures in the heart.
- b) Identify the major blood vessels in the body with surface marking.

Unit 6 Respiratory system (2 Hrs)

- a) Identify naso-pharynx, pharynx, larynx, trachea, bronchi, bronchioles, alveoli and pleura.
- b) Identify thoracic cage and diaphragm

Unit 7 Lymphatic system (2 Hrs)

- a) Identify important groups of lymph nodes

Unit 8 Urinary system (2 Hrs)

- a) Identify kidney, ureter, urinary bladder and urethra

Unit 9 Reproductive system (2 Hrs)

- a) Identify the organs of male and female reproductive system.

Unit 10 Endocrine system (2 hrs)

- a) Identify Pituitary, Thyroid, Parathyroid, Pancreas, Suprarenal, Ovary, and Testis.

Unit 11 Nervous system (3 Hrs)

- a) Identify brain, spinal cord
- b) Identify organs of special sense

Unit 12 Surface anatomy (3 Hrs)

- a) Identify the different organs on the body surface
- b) Identify the different bones of radiological importance in human body
- c) Identify the different land marks of radiological importance in human body

Text books

1. Anatomy and Physiology for Nurses – Jean R W Ross
2. Anatomy and Physiology for Radiographers - ELBS
3. Surface & radiological Anatomy - A. Halim

Reference books

1. Radiographic Anatomy of Human Skeleton – Bryan G
2. Pocket Atlas of Cross-sectional Anatomy CT & MRI Volume I & II – Georgthema Stuttgart

Program: CDR
Subject: Basic Public Health

Hour per week: 4
Total hours: 155
Full marks: 100

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

After the completion of the course, the student 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, and
7. Familiarize with health care delivery system in Nepal,
8. Comprehend health care data system,
9. Orient with ethical aspects and professional standard.

Course Content

THEORY

Unit 1 Introduction to public health (10 Hours)

- a) Public health
- b) Community health
- c) Scope and method
- d) Importance of public health
- e) Application of public health in diagnosis

Unit 2 Basic Epidemiology (10 Hours)

- a) Introduction
- b) Epidemiologic triad
- c) Epidemiologic measurements
- d) Epidemiologic measurements
- e) Disease transmission, prevention and control
- f) Immunization
- g) Screening

Unit 3 Basic hygiene and sanitation (15 Hours)

- a) Water and health
- b) Air pollution
- c) Noise pollution
- d) Housing & ventilation
- e) Water purification
- f) Sterilization

Unit 4 Health education and health promotion (10 Hours)

- a) Introduction
- b) Communication process
- c) Health education methods and media

- d) Importance of health education

Unit 5 Nutrition (10 Hours)

- a) Introduction
- b) Classification of foods
- c) Carbohydrates, Proteins, fats, minerals, vitamins
- d) Mal-nutrition
- e) Food security and food hygiene

Unit 6 Health care delivery system (10 Hours)

- a) National health policy
- b) Concept of health care
- c) Health system
- d) Levels of health care
- e) Concept of health planning and management
- f) Millennium Development Goal (MDG)

Unit 7 Waste disposal system (8 Hours)

- a) Solid waste
- b) Methods of disposal
- c) Excreta disposal
- d) Hospital waste management

Unit 8 Medical and professional ethics (5 Hours)

- a) Introduction to ethics
- b) Medical ethics
- c) Professional ethics
- d) Principles of ethics
- e) National professional ethics

Unit 9 Introduction to Biostatistics (5 Hours)

- a) Definition of biostatistics
- b) Application of biostatistics
- c) Measure of central tendency
- d) Measure of dispersion

Unit 10 Research (2Hrs)

- a) Introduction
- b) Types of research
- c) Methods of research

PRACTICAL

Unit 1 Basic Hygiene and Sanitation (35 Hours)

- a) Analyse the existing drinking water source, waste disposal system, food preparation, preservation technique and measures to control rodent and insects.
- b) Identify the needs of the community regarding personal hygiene and environmental sanitation.
- c) Educate the community for safe hygienic practices and maintenance of sanitary latrine.
- d) Cooperate with other team members in sanitary activities in the community.

Unit 2 Health education needs, methods and media (25 Hours)

- a) Conduct educational diagnosis survey to identify the health education need of a selected community.
- b) Prepare a modular health education plan for deliberation of health education in selected community or health post.
- c) Use following health education method effectively

- i) Communication exercise
 - ii) Group discussion
 - iii) Role play
 - iv) Counselling
 - v) Lecture
 - vi) Demonstration and
 - vii) Exhibition
- d) Collect health education materials from different organisation.
- e) Prepare simple media for health education like
- i) Poster
 - ii) Flannel graph
 - iii) Models
 - iv) Charts and graphs
 - v) Puppets
 - vi) Pamphlets

Unit 3 Health care system (10 Hours)

- a) Observation of health care delivery system in Nepal at different level health institutions.

Textbooks

1. Park's Textbook of Preventive and Social Medicine- K Park

Reference books:

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

Program: CDR
Subject: First Aid/ Primary Health Care /
Maternal and Child Health

Hour per week: 3
Total hours: 117
Full marks: 50

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, burn and other 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 childcare.

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, elements of primary health care, indicator of improvement in the health care and the role of health worker in primary health care.
3. Provide basic maternal, childcare and family planning guidance to the needy.

Course Content

THEORY

Unit 1 First Aid (28 Hrs.)

- a) Define shock, list the causes of shock, and identify first aid measures to the patient in shock.
- b) Identify first aid measures in cases of poisoning (insecticides, rodenticides, drugs and alcohol)
- c) Define cardio-pulmonary resuscitation.
- d) Identify foreign body in ear, nose, throat and eye and provide first aid treatment appropriately.
- e) Classify injury and identify measures to provide first aid appropriately.
- f) Classify types of haemorrhage and identify measures to provide first aid to arrest external bleeding.
- g) Classify burns, its percentage and state the first aid measures to thermal and chemical burns.
- h) Identify measures to management of a case of frostbite.
- i) Identify heat stroke and its first aid appropriately.
- j) Identify measures to provide first aid measures in case of acute mountain sickness.
- k) Identify the broken bones and dislocation and its first aid measures.
- l) List the dangers of rabid animal bite and identify first aid measures.
- m) Identify the measures to be taken in case of snakebite and insect bite.

Unit 2 Primary Health Care (25 Hrs)

- a) Identify the national health policy and health care delivery system.
- b) Identify national health strategy for fulfilling basic minimum needs of health.
- c) Define primary health care.
- d) Enumerate the elements of primary health care and indicator of improvement in the health care.
- e) State principles and strategy for primary health care.
- f) Identify the role of health worker in primary health care.

Unit 3 Maternal and Child Health (25 Hrs)

- a) Six target diseases and immunisation schedule given to prevent them.
- b) Advantages of breast-feeding and disadvantages of bottle feeding.
- c) Weaning food and the advantages of sarbottam pitho.
- d) Causes of child hood diarrhoea in Nepal and its management.
- e) Signs and symptoms of dehydration.
- f) Causes and basic management of acute respiratory infection.
- g) Essential components of maternal health (antenatal care, intranatal care and postnatal care)
- h) Types of family planning methods available in Nepal.

PRACTICAL

Unit 1 First Aid (18 Hrs.)

- a) Measure temperature, pulse and respiration.
- b) Apply dressing, bandages and splint.
- c) Perform cardio-pulmonary resuscitation.
- d) Put patient in different positions and transfer patient from one place to other.
- e) Remove foreign body from eye, ear nose and throat.

Unit 2 Primary Health Care (3 Hrs)

- a) Prepare health care delivery chart.

Unit 3 Maternal and Child Health Care (18 Hrs.)

- b) Prepare Sarbottam Pitho.
- c) Prepare Jeevan Jal (oral rehydration salt solution).
- d) Observe activities of MCH clinic.

Recommended books

1. First Aid - St. John Ambulance
2. First Aid - ICRC
3. Park's Textbook of Preventive and Social Medicine- K Park
4. Annual Report - Department of Health Services, Ministry of Health
5. WHO Publications (related issues) - WHO, Geneva
6. Primary Child Care - M King
7. First Aid and Emergency Nursing - N N.Yalayaswamy
8. Emergency first AID safety oriented - Harvinder popli, Nirmal

Third Year

1. Clinical Radiology
2. Radiography Practical I
3. Radiography Practical II

Program: CDR
Subject: Clinical Radiology

Hour per week: 4
Total hours: 156
Full marks: 100

Course Description

This course provides knowledge and skills on Clinical Radiology. This course focuses on identification of normal conditions, functioning and non-functioning of various internal organs like gall bladder, kidney etc during their procedural investigations.

Course objectives

After the completion of the course, the student will be able to:

1. Identify normal anatomy in the radiograph
2. Identify functioning, non-functioning, normal & abnormal structures of the internal organs,
3. Identify fracture of major bones,
4. Identify radiopaque shadow in the internal organs.

Course Content

Film Viewing Session (at Hospital)

Unit I Bone, Joints, Chest and Abdomen (26 Hours)

- a) Identify fracture of major bones, bone infection, dislocation and subluxation.
- b) Be familiar with pneumonia, tuberculosis, plural effusion and enlargement of heart.
- c) Identify radiopaque shadow in KUB, gall stones, renal stones and obstructive features of bowel gas pattern.

Unit II Special Investigations (52 Hours)

- a) Identify normal structures and functioning in the following examinations:
 - i) IVU
 - ii) Ba series
 - iii) Myelography.
 - iv) Hysterosalpingogram.
 - v) Angiography
 - vi) Other special procedures

Recommended books

1. A Guide to Radiological Procedures – Stephen Chapman, et al

Program: CDR
Subject: Radiography Practical

Hour per week: 35
Total hours: 1248
Full marks: 800

Course Description

This field experience program is designed to help students apply the comprehensive knowledge and skills on actual situation. The program is offered after completing second year.

Course Objectives

At the end of the course, the students will be able to:

1. Perform all routine and some special radiography procedures independently and accurately
2. Assist in special radiological procedures
3. Build confidence on radiography procedures.

Radiography Practical I

Duration: 9 months

Placement schedule

The whole class of students will be divided into groups and asked to perform the following

- Fill up request form and carry out registration process
- Perform manual, automatic and dry film processing.
- Perform routine radiographic examination of lower and upper limbs
- Perform routine radiographic techniques for thoracic cage.
- Perform all routine radiographic technique for abdomens.
- Perform all routine radiographic technique for spine.
- Perform routine radiography technique of skull.
- Perform special views for lower and upper limbs.
- Perform supplementary views of chest. Abdomens, spine, pelvis and skull.

Radiography Practical II

Duration: 3 months

Placement schedule

The whole class of students will be divided into groups and asked to perform the following

- Prepare the patient for special investigation like IVU, barium series, biliary tract imaging, angiography, Myelogram, Digital Radiography, CT scanning, MRI and other special procedures.
- Perform and Assist during the procedure
- Observe the patient after the procedure
- Instruct patient and relatives after the procedure

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.

Distribution of marks for evaluation

Section	Evaluator/Paper	Distribution of marks		Total Marks
		Internal	Final	
1	Clinical Radiology		50	50
2	Radiography practical I	100	400	500
3	Radiography practical II	60	240	300

- Practical and Viva voce examination for both Practical I and II
- Only viva voce examination for Clinical Radiology
- There must be at least one independent qualified external examiner appointed by CTEVT for the final practical and viva voce examination and a radiologist for viva voce on clinical radiology

Important note: Each student must pass in each of the section of the evaluation as presented above with a minimum of 60% marks.

Recommended Books for the Course

Textbooks

1. Park's Textbook of Preventive and Social Medicine - K Park
2. Annual Report - Department of Health Services, Ministry of Health
3. WHO Publications (related issues) - WHO, Geneva
4. Primary Child Care - M King
5. First Aid and Emergency Nursing – N N Yalayaswamy
6. Emergency first AID safety oriented -Harvinder popli, Nirmal
7. Textbook of Health Education – Dharmalingam, et al
8. Ross & Wilson Human Anatomy and Physiology in Health and Illness - Kathleen J W Wilson
9. X-ray equipment for student D. N Chesney & M.O. Chesney
10. A Guide to Radiological Procedures – Stephen Chapman, et al
11. First Year Physics for Radiographer – George A Hay
12. Manual of dark-room technique - P. E. S. Palmer
13. Chesneys' equipment for student radiographers -Peter

Reference Books

1. BD Chaurasia's Human Anatomy- Regional and Applied, Volume I, II & III - BD Chaurasia
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3. Textbook of human Osteology -Inderbir Singh
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5. Essentials of surface & radiological Anatomy -V. Kapur & R. K. Suri.
6. Manual of radiographic interpretation for general Practitioners -World health organization
7. Viva in preventive and social Medicine - Dr. Vidya Ratan
8. Merrill's Atlas of Radiographic Positioning and Diagnostic Procedure, Volume I & II – Philip W Ballinger
9. X-ray Physics and Equipments - Ashworth
10. Physics of Radiology – Johns Charles
11. Physic and Equipment in imagine modalities Stephanie Mass
12. Radiography for technicians - L.C. Gupta, U. C. Gupta
13. Radiological & Imaging secrets - L.C. Gupta, and Abhitabh
14. The home library FIRST AID -Brian Word
15. FIRST AID step by step - John camm and Tim Mcc
16. Radiology dentomaxillofacial - P.K Dayal L. C. Chirs
17. A guide to the x-ray department - Myer Goldman
18. Radiographic and dark-room procedures - L.C. Gupta, and Abhitabh
19. Methods of teaching health education - Dr. Ashok Kumar Jha