Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name : Advanced Diploma in X-ray Radiography

Programme Code : RZ **With Effect From Academic Year: 2023 - 24**

Duration of Programme : One and Half Years (Three Semesters) **Pattern : Semester(Full Time)** **Duration : 16 Weeks**

Semester : First **Scheme : I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme													Grand Total
								Theory										Practical							
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total					
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
a	b	c	d	e	f	g	h(e+f+g)	i	j	k	l	m	n(j+l)	o	p	q	r	s	t(p+r)	u	v(n+t)
1	Human Anatomy, Physiology & Pathology Part - 1	HAP	28130	3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
2	Radiological Physics	RZF	28131	3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
3	Radiographic and Image Processing Techniques	RIP	28045	3	--	1	4	--	--	--	--	--	--	--	50#$	25	50	25	**100**	50	**100**
4	Clinical Education Part 1 (Studentship)	CEP	28046	--	--	18	18	--	--	--	--	--	--	--	100#	50	100	50	**200**	100	**200**
			Total	**09**	**02**	**19**	**30**	--	**140**	--	**60**	--	**200**	--	**150**	--	**150**	--	**300**	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks : **500**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

@Internal Assessment, # External Assessment, *# On Line Examination.

* The average of 2 test to be taken during the semester for the assessment.

#$ External PR ESE and average of 2 Skill tests / Practicals.

@$ Internal PR ESE and average of 2 Skill tests / Practicals.

If student remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE.

- **Candidates not securing minimum marks for passing the "PA" part of practical of any course is declared as "Detained" for that semester.**
- **During Internship and Project period students shall attend Institute one day in a week to meet the mentor and appraise about the progress. The log book, Project Diary and Internship performance shall be recorded by the mentor for progressive assessment.**

Note : The Institute is required to sign MOU with related local authories for Hospital Training/Internship/Studentship

Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name : Advanced Diploma in X-ray Radiography

Programme Code : RZ **With Effect From Academic Year: 2023 - 24**

Duration of Programme : One and Half Years (Three Semesters) **Pattern : Semester(Full Time)** **Duration : 16 Weeks**

Semester : Second **Scheme : I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme												Grand Total
								Theory							Practical						
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total		
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
a	b	c	d	e	f	g	h(e+f+g)	i	j	k	l	m	n(j+l)	o	p	q	r	s	t(p+r)	u	v(n+t)
1	Human Anatomy, Physiology & Pathology Part - 2	HAP	28218	3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
2	Clinical Radiography - Positioning Part - 1	CRP	28093	3	--	1	4	--	--	--	--	--	--	--	50#$	25	50	25	**100**	50	**100**
3	Conventional Radiological Equipments	CRE	28219	3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
4	Clinical Education Part - 2 (Studentship)	CEP	28094	--	--	18	18	--	--	--	--	--	--	--	100#	50	100	50	**200**	100	**200**
			Total	**09**	**02**	**19**	**30**	--	**140**	--	**60**	--	**200**	--	**150**	--	**150**	--	**300**	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks : **500**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

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#$ External PR ESE and average of 2 Skill tests / Practicals.

@$ Internal PR ESE and average of 2 Skill tests / Practicals.

If student remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE.

- **Candidates not securing minimum marks for passing the "PA" part of practical of any course is declared as "Detained" for that semester.**
- **During Internship and Project period students shall attend Institute one day in a week to meet the mentor and appraise about the progress. The log book, Project Diary and Internship performance shall be recorded by the mentor for progressive assessment.**

Note : The Institute is required to sign MOU with related local authories for Hospital Training/Internship/Studentship

Maharashtra State Board of Technical Education, Mumbai

Teaching and Examination Scheme

Programme Name : Advanced Diploma in X-ray Radiography

Programme Code : RZ **With Effect From Academic Year: 2023 - 24**

Duration of Programme : One and Half Years (Three Semesters) **Pattern : Semester(Full Time)** **Duration : 16 Weeks**

Semester : Third **Scheme : I**

S. N.	Course Title	Course Abbreviation	Course Code	Teaching Scheme			Credit (L+T+P)	Examination Scheme													Grand Total
								Theory										Practical							
								Exam Duration in Hrs.	ESE		PA		Total		ESE		PA		Total					
				L	T	P			Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
a	b	c	d	E	f	g	h(e+f+g)	i	j	k	l	m	n(j+l)	o	p	q	r	s	t(p+r)	u	v(n+t)
1	Clinical Radiography - Positioning Part - 2	CRP	28728	3	--	1	4	--	--	--	--	--	--	--	50#$	25	50	25	**100**	50	**100**
2	Contrast & Special Radiography Procedures	CSR	28309	3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
3	Quality Control in Radiology & Radiation Safety	QCR	28310	3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--	**100**
4	Clinical Education Part - 3 (Studentship)	CEP	28729	--	--	18	18	--	--	--	--	--	--	--	100#	50	100	50	**200**	100	**200**
			Total	**09**	**02**	**19**	**30**	--	**140**	--	**60**	--	**200**	--	**150**	--	**150**	--	300	--	**500**

Student Contact Hours Per Week: **30 Hrs.** **Theory and practical periods of 60 minutes each.** Medium of Instruction: **English** Total Marks : **500**

Abbreviations: ESE- End Semester Exam, PA- Progressive Assessment, L - Lectures, T - Tutorial, P - Practical

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If student remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE.

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- **During Internship and Project period students shall attend Institute one day in a week to meet the mentor and appraise about the progress. The log book, Project Diary and Internship performance shall be recorded by the mentor for progressive assessment.**

Note : The Institute is required to sign MOU with related local authories for Hospital Training/Internship/Studentship


MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION MUMBAI

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY
PROGRAMME CODE : RZ
SEMESTER : FIRST
COURSE TITLE : HUMAN ANATOMY, PHYSIOLOGY & PATHOLOGY PART-1
COURSE CODE : 28130

1. RATIONALE

Anatomy, Physiology & Pathology is designed for the students to know the surface and radiological human anatomy to correctly position the patient for radiography of a particular anatomical area.

2. COMPETENCY

The combined regional and systematic approach to examine the relationships and organization of the major structures within the thorax, abdomen, head/neck, and back/limbs regions of the body.

3. COURSE OUTCOMES

After studying this course learner will be able to

- Explain the anatomy, physiology and functions of various Tissues and cell, organization of cellular system and composition of blood.
- Explain the anatomy and physiology of human brain and spinal cord
- Explain the anatomical structure of head and neck.
- Understand the skeletal components and Describe the boundaries of the thorax, its inlet and outlet
- Identify and explain Anatomical and physiological structure of abdomen and pelvic region.
- Describe the human skeletal structure and surface anatomy

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory						Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
03	01	--	04	1.5	70*#	35	30*	00	100	50	--	--	--	--	--	--

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order toattain the identified competencies.

Unit	Topic and contents	Hours	Marks
I	**Cell, Tissue, Blood & Lymph** Normal Cell- Function Of the Cell,The cell membrane, The nucleus, The cytoplasm Tissue – Function & Structure of general tissue Types of tissue-Epithelial tissue,Connective tissue,Muscle tissuc,Nervous tissue. Composition and function of blood-plasma, red blood cells, white blood cells, and platelets. Lymphatic system- **Lymph** Lymphatic Vessels, Lymphatic Organ	06	10
II	**Brain and spinal Cord** Brain- functions of brain, part of the brain, central nervous system. Spinal Cord-anatomy, structure & function.	06	12
III	**Head & Neck** Anatomical aspects of the head and neck, such as the skull, eyes, teeth, nose, ears, and Mouth/oral cavity , thyroid gland, parathyroid glands, pharynx and larynx.	06	12
IV	**Thorax** Lung, Trachea, esophagus, Diaphragm, Heart, Aorta, Mediastinum, Ribs, Sternum, scapula, clavicle, thorax vertebral Column. Thoracic arterial& venous system.	09	12
V	**Abdomen, Pelvis and pelvic organs** Abdomen & pelvic organs-stomach, spleen, liver, gall bladder, pancreas, kidney, ureters, bladder, small & large intestine, appendix, reproductive organs, abdominal arterial& venous system	09	12
VI	**Skeleton** All human body bone-skull/face/neck/thorax/abdomen/pelvis /upper & lower limb Surface Anatomy (Landmarks)	12	12
	Total	48	70

7. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Cell, Tissue, Blood & Lymph	06	10	00	00	10
II	Brain and spinal Cord	06	04	04	04	12
III	Head & Neck	06	04	04	04	12
IV	Thorax	09	04	04	04	12
V	Abdomen, Pelvis and pelvic organs	09	04	04	04	12
VI	Skeleton	12	04	04	04	12
Total		**48**	**30**	**20**	**20**	**70**

Legends: R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)
Note: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

8. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Foundation of Anatomy and Physiology	Ross Wilson	Churchill Livingstone
2	Human Anatomy	B. D. Chaurasia	CBS Publishers, Delhi

PROGRAMME NAME : **ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY**
PROGRAMME CODE : **RZ**
SEMESTER : **FIRST**
COURSE TITLE : **RADIOLOGICAL PHYSICS**
COURSE CODE : **28131**

1. RATIONALE

This subject, Radiological Physics, is designed for the students to have an understanding of important areas in Physics, knowledge of which are essential in understanding the principles and functioning of equipment's and various physical and chemical processes.

2. COMPETENCY

Better understanding of the Principles of Radiological Physics. Imaging equipment's, production of radiographs and the assessment of image quality, construction of the imaging and processing equipment's.

3. COURSE OUTCOMES

On completion of this subject students will be able to–

- Describe principles of medical imaging
- Identify the main components of the basic X-ray tube, and its usage.
- Identify and explain traditional and advanced X-ray accessories.
- Explain the operation of the imaging equipment.
- Produce radiographs and assess image quality.
- Demonstrate knowledge of specified imaging modalities, relevant anatomy, image quality assurance and diagnostic decision making.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory						Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
03	01	--	04	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

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5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and contents	Hours	Marks
I	**High Tension Generators** Introduction & function of High Tension Generators	03	10
II	**Radiation Physics** Source of radiation, type of radiation, ionizing radiation & non ionizing radiation, Atomic and nuclear structure	06	12
III	**X-rays Tube** Composition of x-ray tube, function of x-ray tube, x-ray production.	12	12
IV	**Accessories** Cassette, Films, Intensifying Screen and Grids – introduction, composition, function ,difference between traditional & advance	12	12
V	**Digital Radiography** CR, DR, DICOM, PACS, RIS, HIS -Brief introduction , composition, function, advantage	12	12
VI	**Fluoroscopy** Introduction , composition, function	03	12
Total		**48**	**70**

7. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	High Tension Generators	03	04	03	03	10
II	Radiation Physics	06	04	04	04	12
III	X-rays Tube	12	04	04	04	12
IV	Accessories	12	04	04	04	12
V	Digital Radiography	12	04	04	04	12
VI	Fluoroscopy	03	04	04	04	12
Total		**48**	**24**	**23**	**23**	**70**

Legends: R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)
Note: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

8. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	X-ray Physics and Equipment	Ashuworth	Blackwell Scientific Weight
2	X-ray equipment for Student Radiographers	D N Chesney, M O Chesney	CBS Publishers, Delhi.

Sr. No.	Title of Book	Author	Publication
3	Radiological Science for Technologist, Physics, Biology and Protection	Bushong, Stewart C	Mosby, St. Louis

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY

PROGRAMME CODE : RZ

SEMESTER : FIRST

COURSE TITLE : RADIOGRAPHIC AND IMAGE PROCESSING TECHNIQUES

COURSE CODE : 28045

1. RATIONALE

This subject, Radiographic & Image Processing Techniques, is designed for the students to be familiar with principles of radiographic imaging, to apply this knowledge to the production of radiograph and the assessment of image quality, to understand the construction, operation of imaging and processing equipment.

2. COMPETENCY

Practice the procedures employed in producing a radiographic image.

3. COURSE OUTCOMES

On completion of this subject, students should be able to:

- Control and manipulate parameters associated with exposure and processing to produce a required image of desirable quality.
- Carry out quality control for processing, evaluate and act on results.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	--	1	4	--	--	--	--	--	--	--	50#$	25	50	25	100	**50**

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5. LIST OF PRACTICALS/ EXERCISES/ASSIGNMENTS/CASE STUDIES

Students have to write Journals on following Topics -	
Sr. No.	**Title**
1	Photographic Process
2	Developer Chemicals
3	Fixer Chemicals
4	Dark Room
5	Safe Light
6	Manual Film Processing

Students have to write Journals on following Topics -	
Sr. No.	**Title**
7	Automatic Film Processing
8	Care of Automatic Film Processing
9	X-ray Films
10	X-ray Cassette
11	Intensifying Screen
12	Artifacts
13	CR Plate & Image Processing
14	DR Detector & Image processing
15	Digital Film printing
16	Quality Assurance in Radiology

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours
I	The photographic process - Introduction & function	**06**
II	Film processing - Introduction & function Manual film processing. Developing, rinsing, fixing and drying.	**03**
III	Auto film processing - Introduction & function Processing. Developing, rinsing, fixing and drying, Care of Processor	**12**
IV	Film materials in x-ray departments-Construction & properties of x-ray film, Film base, Film emulsion.	**12**
V	Image Receptor, Introduction ,General Properties of Receptors, Film and Screen-Film Systems, Digital Receptors	**12**
VI	Radiographic image Quality- introduction, Components of Radiographic Image Quality, Contrast, Resolution, Noise, Artifacts, Exposure factor	**03**
Total		**48**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Diagnostic Radiology and Imaging for Technicians	A N Shastri	Jaypee Brothers
2	Medical Radiographic Technique and Dark Room Practices	A Krishnamurthy	Jaypee Brothers
3	Medical X-Ray Film Processing	K Thayalan	Jaypee Brothers
4	Radio-physics and Dark Room Procedure	L.C. Gupta, Abhitabh Gupta	Jaypee Brothers

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY
PROGRAMME CODE : RZ
SEMESTER : FIRST
COURSE TITLE : CLINICAL EDUCATION PART - 1 (STUDENTSHIP)
COURSE CODE : 28046

1. RATIONALE

The Clinical Education, is designed for the students to familiarize them with the applications of radiography. Student should be able to reliably perform all non-contrast plain Radiography.

2. COMPETENCY

Identify the Anatomy to me Imaged, properly position the patient for Imaging, Correctly select appropriate projection/projections to demonstrate the area of interest Use appropriate radiographic parameters

3. COURSE OUTCOMES

On completion of this subject, the student should be able to:

- Correctly Identify the Anatomy to me Imaged.
- To properly position the patient for Imaging
- Correctly select appropriate projection/projections to demonstrate the area of interest
- Use appropriate radiographic parameters to produce a radiograph with satisfactory results
- Differentiate a properly positioned and exposed radiograph from a wrongly positioned and over or underexposed radiograph.
- Correctly identify anatomical features displayed in radiograph obtained.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
--	--	18	18	--	--	--	--	--	--	--	100#	50	100	50	**200**	100	

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*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ASSIGNMENTS/CASE STUDIES

Students have to do hands on practice on following Radiographic positioning & Radiographic Techniques on -	
Sr. No.	**Name of Practical/ Exercise/ Assignment/ Case Study**
1	Upper limb
2	Lower limb
3	Shoulder girdle
4	Thorax
5	Abdomen
6	Vertebral column
7	Pelvic girdle and hip region
8	Skeletal survey
9	Skull
10	Facial Bones

6. GENERAL GUIDELINES FOR CLINICAL EDUCATION (STUDENTSHIP)

The Institutes/Hospitals/Diagnostic Centers can be Government, Public limited, private enterprises or ownership.

- **Duration of Industrial Training**: 18 Hours for 16 weeks as per the credits of the programme
- **Training Area:** Students should be trained in Large and Medium scale Hospitals/Diagnostic Centers. However, despite the best efforts by the Institute, if large and medium scale Hospitals/Diagnostic Centers are not available to all students then, students can also be placed in Small scale Institutes/Hospitals/Diagnostic Centers.
- **Skill Knowledge Partner (SKP) :**To be identified by the Institute as per their programme areas like

1. Government Hospitals.
2. Corporate Hospitals
3. Private Hospitals
4. Diagnostic Centers
5. Any other relevant industry

7. EXPECTATIONS FROM Skill Knowledge Partner(SKP)

Helping institute in developing the following competencies among students

- Soft Skills i.e. Communication, Presentation and others.
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others
- Hands-on Practices i.e. Patient Safety, Radiography and Quality Assurance aspects.

8. ROLE OF PARENT DEPARTMENT OF THE INSTITUTE

- Collecting information about Hospitals/Diagnostic Centers available for training along with capacity.
- Institutions have to enter in to MOU with number of SKPs (Institutes/Hospitals/Diagnostic Centers) for accommodating all the enrolled students for the mandatory

- Student and mentor allocation as per the slots available for Hands on training (Desirable mentor- student ratio is 1:10).
- Communication with Institutes/Hospitals/Diagnostic Centers available for training along with capacity and its confirmation.
- Student enrollment for training.
- Issuing letter to the Institutes/Hospitals/Diagnostic Centers for the training along with details of students and mentors.
- Principal/ HOD/ Faculty should address students about safety norms, rules and discipline to be maintained in the Institutes/Hospitals/Diagnostic Centers during the training before relieving students for training.
- The faculty member during the visit to Institutes/Hospitals/Diagnostic Centers will check the progress of the student in the training, his/ her attendance, discipline, log book preparation &project report preparation
- Mentors to carry out progressive assessment of the students during the training through Progressive Assessment (PA).
- End Semester Examination (ESE) assessment by mentor along with Institutes/Hospitals/Diagnostic Centers expert as external examiner

- **ROLES AND RESPONSIBILITIES OF THE STUDENTS**

Following should be informed to students in the letter deputing them for the training; an undertaking for this should also be taken from them

- Students would interact with the mentor to suggest choices for suitable Institutes/Hospitals/Diagnostic Centers. If students have any contact in Institutes/Hospitals/Diagnostic Centers (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
- Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the Institutes/Hospitals/Diagnostic Centers on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Institutes/Hospitals/Diagnostic Centers and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- Students should know that if they break any rule of Institutes/Hospitals/Diagnostic Centers or do not follow the discipline then Institutes/Hospitals/Diagnostic Centers can terminate the training and send back the student.
- It is the responsibility of the student to collect information from Institutes/Hospitals/Diagnostic Centers about Radiography procedures/ Patient Safety /work ethics/professional practices/organizational structure etc.
- During the training period students have to keep daily record of all the useful information in Log book
- Maintain the Diary/Logbook and get it signed from mentor as well as Institutes/Hospitals/Diagnostic Centers Training in-charge.

- In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Institutes/Hospitals/Diagnostic Centers training in-charge.

9. FORMAT FOR TRAINING REPORT

Following is the suggestive format for the training report; actual format may differ slightly depending upon the nature of Institutes/Hospitals/Diagnostic Centers. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1. Organizational structure of Institutes/Hospitals/Diagnostic Centers and General Lay Out

Chapter 2. Introduction of Institutes/Hospitals/Diagnostic Centers(History, Facilities available. Specialization and number of employees etc.)

Chapter 3. Types of major equipment/instruments/ machines used in Radiology with their specification, approximate cost and specific use and their routine maintenance.

Chapter 4. Standard Operating procedures.

Chapter 5. Quality assurance procedures.

Chapter 6. Equipment handling and procedures.

Chapter 7. Safety procedures followed

Chapter 8. Particulars of Practical Experiences in Radiology

Chapter 9. Short report/description of the project (if any done during the training)

Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

- References /Bibliography

10. SUGGESTED LEARNING STRATEGIES

Students should visit the website of the Institutes/Hospitals/Diagnostic Centers where they are undergoing training to collect information about Facilities, Specialization, capacity, number of employees, etc. They should also refer the operating manuals of the major machines and operation, testing, quality control and standard operating procedures and practices used in the Radiology. Students may also visit websites related to other similar industries as their learning resource.The training activity may vary according to nature and size of Institutes/Hospitals/Diagnostic Centers. The details of activities to be completed during 16 weeks should be planned appropriately. The evaluation of Clinical Education (Studentship)will be done on the basis of skills acquired by the student during this 16 weeks period.

ASSESSMENT SCHEME FOR CLINICAL EDUCATION (STUDENTSHIP)

Training duration	END SEMESTER ASSESSMENT (Practical and Oral)		PROGRESSIVE ASSESSMENT (Weekly report of all 16 week and attendance)		Total marks	
Sixteen Weeks	Max. marks	Min. marks	Max. marks	Min. marks	Max. marks	Min. marks
	100#	50	100	50	200	100

External Assessment

EVALUATION SHEET FOR CLINICAL EDUCATION (STUDENTSHIP)

Sr. No.	Enrollment Number	Name of Student	Marks by Mentor & Industry Supervisor jointly	Marks by Industry Supervisor	Marks by Mentor Faculty	Total Marks
			Out of 40 (A)	Out of 30 (B)	Out of 30 (C)	Out of 100 (A+B+C)

DISTRIBUTION OF END-SEMESTER-EXAMINATION (ESE) MARKS OF CLINICAL EDUCATION (STUDENTSHIP)

Marks for Training Report	Marks for Practical's	Marks for Oral/Viva-voce	Total ESE marls
25	25	50	100

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY

PROGRAMME CODE : RZ

SEMESTER : SECOND

COURSE TITLE : HUMAN ANATOMY, PHYSIOLOGY & PATHOLOGY PART - 2

COURSE CODE : 28218

1. RATIONALE

Anatomy, Physiology & Pathology is designed for the students to know the surface and radiological human anatomy to correctly position the patient for radiography of a particular anatomical area.

2. COMPETENCY

The combined regional and systemic approach to examine the relationships and organization of the major structures within the thorax, abdomen, head/neck, and back/limbs regions of the body.

3. COURSE OUTCOMES

The objectives of this subject is to provide a clear and thorough practical working knowledge of the Anatomy Physiology & Pathology of all the major systems within the human body. This should provide a sufficiently solid grounding for the students.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	1	--	4	1.5	70*#	35	30*	00	100	50	--	--	--	--	--	--

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends:** L-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**Skin** Structure & function of skin	03	10
II	**Organs of Senses & Endocrine System** Eyes, nose, ear, tongue (structure & function) Hypothalamus, Pituitary gland, gonads, Thyroid gland, parathyroid ,thymus gland, adrenal gland, pancreas (structure & function)	03	12
III	**Digestive System** Structure & function - esophagus, Stomach, small & large intestine ,liver , spleen, Pancreas	12	12
IV	**Urogenital System** Structure & function - kidney, ureters, bladder, male & female reproductive system.	12	12
V	**Respiratory & Circulatory System** Nasal cavity, trachea and larynx, lung Artery & venous system	09	12
VI	**Nervous & Lymphatic System** CNS, Spinal cord lymphatic vessels system	09	12
Total		48	70

7. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Skin	03	04	03	03	10
II	Organs of Senses & Endocrine System	03	04	04	04	12
III	Digestive System	12	4	04	04	12
IV	Urogenital System	12	04	04	04	12
V	Respiratory & Circulatory System	09	04	04	04	12
VI	Nervous & Lymphatic System	09	04	04	04	12
Total		**48**	**24**	**23**	**23**	**70**

Legends: R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)
Note: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

8. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Foundation of Anatomy and Physiology	Ross Wilson	Churchill Livingstone
2	Human Anatomy	B. D. Chaurasia	CBS Publishers, Delhi

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY
PROGRAMME CODE : RZ
SEMESTER : SECOND
COURSE TITLE : CLINICAL RADIOGRAPHY - POSITIONING PART - 1
COURSE CODE : 28093

1. RATIONALE

The Clinical Radiography Positioning, is designed for the students to familiarize them with the applications of radiography. Student should be able to reliably perform all non-contrast plain Radiography

2. COMPETENCY

Identify the Anatomy to me Imaged. properly position the patient for Imaging: correctly select appropriate projection/projections to demonstrate the area of interest Use appropriate radiographic parameters

3. COURSE OUTCOMES

On completion of this subject, the student should be able to:

- Correctly Identify the Anatomy to me Imaged.
- To properly position the patient for Imaging
- Correctly select appropriate projection/projections to demonstrate the area of interest
- Use appropriate radiographic parameters to produce a radiograph with satisfactory results
- Differentiate a properly positioned and exposed radiograph from a wrongly positioned and over or underexposed radiograph.
- Correctly identify anatomical features displayed in radiograph obtained.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	--	1	4	--	--	--	--	--	--	--	50#$	25	50	25	100	50	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends:** L-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ASSIGNMENTS/CASE STUDIES

Students have to write Journals on following Topics -	
Sr. No.	**Name of Practical/ Exercise/ Assignment/ Case Study**
1	Radiographic Techniques of Hand AP & Oblique Views
2	Radiographic Techniques of Wrist joint AP & Oblique Views
3	Radiographic Techniques of Forearm AP & Lat Views
4	Radiographic Techniques of Elbow joint AP & Lat Views
5	Radiographic Techniques of Humerus AP & Lat Views
6	Radiographic Techniques of Foot AP & Oblique Views
7	Radiographic Techniques of Ankle AP & lat Views
8	Radiographic Techniques of Leg AP & lat Views
9	Radiographic Techniques of Knee joint AP & lat Views
10	Radiographic Techniques of Knee joint Skyline View
11	Radiographic Techniques of Femur AP & lat Views
12	Radiographic Techniques of Shoulder AP View
13	Radiographic Techniques for Scapula
14	Radiographic Techniques of Chest PA View
15	Radiographic Techniques of Erect Abdomen
16	Radiographic Techniques of KUB

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours
I	Radiographic Techniques of Upper limb-, humerus, elbow joint, Forearm, wrist joint, hand positioning & technical factor	**09**
II	Radiographic Techniques of Lower limb-, femur, knee joint, leg, ankle joint, foot positioning & technical factor	**09**
III	Radiographic Techniques of Pelvic girdle-positioning & technical factor	**06**
IV	Radiographic Techniques of Shoulder girdle- clavicle ,scapula, sternum positioning & technical factor	**06**
V	Radiographic Techniques of Thorax positioning & technical factor	**09**
VI	Radiographic Techniques of Abdomen positioning & technical factor	**09**
Total		**48**

7. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Clark's Positioning in Radiology	S. Whitley, C. Sloane, G. Hoadley, A. Moore, C. Alsop.	Hodder Arnold, London.
2	Merrill's Atlas of Radiographic Positioning & procedures	Frank, long, Smith	Mosby, Elsevier
3	Textbook of Radiology for Residents and Technicians	Satish K Bhargava	CBS Publishers, Delhi

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY

PROGRAMME CODE : RZ

SEMESTER : SECOND

COURSE TITLE : CONVENTIONAL RADIOLOGICAL EQUIPMENTS

COURSE CODE : 28219

1. RATIONALE

This subject, Conventional Radiological Equipments, is designed for the students to have an understanding of principles and functioning of equipments and various physical and chemical processes. The students will be introduced to the role of various associated accessories that are used in the imaging. The students will be given hands on experience of handling of various x-ray machines under supervision.

2. COMPETENCY

It enable students to understand the construction, design, operation of imaging and processing equipments and to familiarize them with the basics and technological aspects of imaging equipments.

3. COURSE OUTCOMES

On completion of this subject students will be

- Describe the construction and operation of general radiographic equipments.
- Practice the procedures employed in producing a radiographic image.
- Carry out procedures associated with routine maintenance of imaging and processing Equipments.
- Better understanding of the imaging equipments and will be able to apply this knowledge in the production of radiographs and the assessment of image quality.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme											
				Theory						Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	1	--	4	1.5	70*#	35	30*	00	100	50	--	--	--	--	--	--

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order toattain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**High tension circuits & Interlocking circuits** X-ray circuits – self rectifying circuits – half wave pulsating voltage circuits – full valve pulsating voltage circuits - measurement of high voltage – control of KV circuit – mA circuit.	03	10
II	**Production of x-rays** Basic concepts of power, force, energy, electricity, magnetism and their units and measurements, electromagnetic induction – Atomic structure – radioactivity- ionization and excitation, –	09	12
III	**X-ray Tube** Construction, Types of X-ray Tubes , Difference between X-ray, OPG, Mammography X-ray tubes	12	12
IV	**Meters and exposure timers** Introduction & function kV, mA, Seconds, mAs	06	12
V	**Fluoroscopy** Introduction & function, Image Intensifier Tube, C-arm, DSA	12	12
VI	**General Care and Maintenance of X-ray equipment** Introduction & Safety	06	12
Total		48	70

7. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	High tension circuits & Interlocking circuits	03	04	03	03	10
II	Production of x-rays	09	04	04	04	12
III	X-ray tube	12	04	04	04	12
IV	Meters and exposure timers	06	04	04	04	12
V	Fluoroscopy	12	04	04	04	12
VI	General Care and Maintenance of X-ray equipment	06	04	04	04	12
Total		**48**	**38**	**24**	**23**	**70**

Legends: R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)

Note: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

8. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	An Introduction to the Physics of Diagnostic Radiology	Christensen Etal	K M Verghese & Co.
2	Diagnostic Radiology and Imaging for Technicians	A N Shastri	Jaypee Brothers
3	Radiological Science for Technologist, Physics, Biology and Protection	Bushong, Stewart C	Mosby, St. Louis
4	Textbook of Radiology and Imaging	Sutton D	Churchill Livingstone, UK

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY
PROGRAMME CODE : RZ
SEMESTER : SECOND
COURSE TITLE : CLINICAL EDUCATION PART -2 (STUDENTSHIP)
COURSE CODE : 28094

1. RATIONALE

The Clinical Education is **designed** for the students to familiarize them with the applications of radiography. Student should be able to reliably perform all non-contrast plain Radiography

2. COMPETENCY

Identify the Anatomy to me Imaged, properly position the patient for Imaging, Correctly select appropriate projection/projections to demonstrate the area of interest Use appropriate radiographic parameters.

3. COURSE OUTCOMES

On completion of this subject, the student should be able to:

- Correctly Identify the Anatomy to me Imaged.
- To properly position the patient for Imaging
- Correctly select appropriate projection/projections to demonstrate the area of interest
- Use appropriate radiographic parameters to produce a radiograph with satisfactory results
- Differentiate a properly positioned and exposed radiograph from a wrongly positioned and over or underexposed radiograph.
- Correctly identify anatomical features displayed in radiograph obtained.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
--	--	18	18	--	--	--	--	--	--	--	100#	50	100	50	**200**	100

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends:** L-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ASSIGNMENTS/CASE STUDIES

Students have to do hands on practice on following Radiographic positioning & Radiographic Techniques on -	
Sr. No.	**Name of Practical/ Exercise/ Assignment/ Case Study**
1	Upper limb
2	Lower limb
3	Shoulder girdle
4	Thorax
5	Abdomen
6	Vertebral column
7	Pelvic girdle and hip region
8	Skeletal survey
9	Skull
10	Facial Bones

6. GENERAL GUIDELINES FOR Clinical Education (Studentship)

The Institutes/Hospitals/Diagnostic Centers can be Government, Public limited, private enterprises or ownership.

- **Duration of Industrial Training**: 18 Hours for 16 weeks as per the credits of the programme
- **Training Area:** Students should be trained in Large and Medium scale Hospitals/Diagnostic Centers. However, despite the best efforts by the Institute, if large and medium scale Hospitals/Diagnostic Centers are not available to all students then, students can also be placed in Small scale Institutes/Hospitals/Diagnostic Centers.
- **Skill Knowledge Partner (SKP) :**To be identified by the Institute as per their programme areas like

1. Government Hospitals.
2. Corporate Hospitals
3. Private Hospitals
4. Diagnostic Centers
5. Any other relevant industry

7. EXPECTATIONS FROM Skill Knowledge Partner(SKP)

Helping institute in developing the following competencies among students

- Soft Skills i.e. Communication, Presentation and others.
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others
- Hands-on Practices i.e. Patient Safety, Radiography and Quality Assurance aspects.

8. ROLE OF PARENT DEPARTMENT OF THE INSTITUTE

- Collecting information about Hospitals/Diagnostic Centers available for training along with capacity.
- Institutions have to enter in to MOU with number of SKPs (Institutes/Hospitals/Diagnostic Centers) for accommodating all the enrolled students for the mandatory

- Student and mentor allocation as per the slots available for Hands on training (Desirable mentor- student ratio is 1:10).
- Communication with Institutes/Hospitals/Diagnostic Centers available for training along with capacity and its confirmation.
- Student enrollment for training.
- Issuing letter to the Institutes/Hospitals/Diagnostic Centers for the training along with details of students and mentors.
- Principal/ HOD/ Faculty should address students about safety norms, rules and discipline to be maintained in the Institutes/Hospitals/Diagnostic Centers during the training before relieving students for training.
- The faculty member during the visit to Institutes/Hospitals/Diagnostic Centers will check the progress of the student in the training, his/ her attendance, discipline, log book preparation &project report preparation
- Mentors to carry out progressive assessment of the students during the training through Progressive Assessment (PA).
- End Semester Examination (ESE) assessment by mentor along with Institutes/Hospitals/Diagnostic Centers expert as external examiner

9. ROLES AND RESPONSIBILITIES OF THE STUDENTS

Following should be informed to students in the letter deputing them for the training; an undertaking for this should also be taken from them

- Students would interact with the mentor to suggest choices for suitable Institutes/Hospitals/Diagnostic Centers. If students have any contact in Institutes/Hospitals/Diagnostic Centers (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
- Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the Institutes/Hospitals/Diagnostic Centers on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Institutes/Hospitals/Diagnostic Centers and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- Students should know that if they break any rule of Institutes/Hospitals/Diagnostic Centers or do not follow the discipline then Institutes/Hospitals/Diagnostic Centers can terminate the training and send back the student.
- It is the responsibility of the student to collect information from Institutes/Hospitals/Diagnostic Centers about Radiography procedures/ Patient Safety /work ethics/professional practices/organizational structure etc.
- During the training period students have to keep daily record of all the useful information in Log book
- Maintain the Diary/Logbook and get it signed from mentor as well as Institutes/Hospitals/Diagnostic Centers Training in-charge

- In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Institutes/Hospitals/Diagnostic Centers training in-charge.

10. FORMAT FOR TRAINING REPORT

Following is the suggestive format for the training report; actual format may differ slightly depending upon the nature of Institutes/Hospitals/Diagnostic Centers. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1. Organizational structure of Institutes/Hospitals/Diagnostic Centers and General Lay Out

Chapter 2. Introduction of Institutes/Hospitals/Diagnostic Centers(History, Facilities available. Specialization and number of employees etc.)

Chapter 3. Types of major equipment/instruments/ machines used in Radiology with their specification, approximate cost and specific use and their routine maintenance.

Chapter 4. Standard Operating procedures.

Chapter 5. Quality assurance procedures.

Chapter 6. Equipment handling and procedures.

Chapter 7. Safety procedures followed

Chapter 8. Particulars of Practical Experiences in Radiology

Chapter 9. Short report/description of the project (if any done during the training)

Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

- References /Bibliography

11. SUGGESTED LEARNING STRATEGIES

Students should visit the website of the Institutes/Hospitals/Diagnostic Centers where they are undergoing training to collect information about Facilities, Specialization, capacity, number of employees, etc. They should also refer the operating manuals of the major machines and operation, testing, quality control and standard operating procedures and practices used in the Radiology. Students may also visit websites related to other similar industries as their learning resource.The training activity may vary according to nature and size of Institutes/Hospitals/Diagnostic Centers. The details of activities to be completed during 16 weeks should be planned appropriately. The evaluation of Clinical Education (Studentship)will be done on the basis of skills acquired by the student during this 16 weeks period.

ASSESSMENT SCHEME FOR CLINICAL EDUCATION (STUDENTSHIP)

Training duration	END SEMESTER ASSESSMENT (Practical and Oral)		PROGRESSIVE ASSESSMENT (Weekly report of all 16 week and attendance)		Total marks	
Sixteen Weeks	Max. marks	Min. marks	Max. marks	Min. marks	Max. marks	Min. marks
	100#	50	100	50	200	100

External Assessment

EVALUATION SHEET FOR CLINICAL EDUCATION (STUDENTSHIP)

Sr. No.	Enrollment Number	Name of Student	Marks by Mentor & Industry Supervisor jointly	Marks by Industry Supervisor	Marks by Mentor Faculty	Total Marks
			Out of 40 (A)	Out of 30 (B)	Out of 30 (C)	Out of 100 (A+B+C)

DISTRIBUTION OF END-SEMESTER-EXAMINATION (ESE) MARKS OF CLINICAL EDUCATION (STUDENTSHIP)

Marks for Training Report	Marks for Practical's	Marks for Oral/Viva-voce	Total ESE marls
25	25	50	100

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY
PROGRAMME CODE : RZ
SEMESTER : THIRD
COURSE TITLE : CLINICAL RADIOGRAPHY - POSITIONING PART - 2
COURSE CODE : 28728

1. RATIONALE

The Clinical Radiography Positioning is designed for the students to familiarize them with the applications of radiography. Student should be able to reliably perform all non-contrast plain Radiography

2. COMPETENCY

Identify the Anatomy to me Imaged, properly position the patient for Imaging, Correctly select appropriate projection/projections to demonstrate the area of interest Use appropriate radiographic parameters

3. COURSE OUTCOMES

On completion of this subject, the student should be able to:

- Correctly Identify the Anatomy to me Imaged.
- To properly position the patient for Imaging
- Correctly select appropriate projection/projections to demonstrate the area of interest
- Use appropriate radiographic parameters to produce a radiograph with satisfactory results
- Differentiate a properly positioned and exposed radiograph from a wrongly positioned and over or underexposed radiograph.
- Correctly identify anatomical features displayed in radiograph obtained.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	--	1	4	--	--	--	--	--	--	--	50#$	25	50	25	100	50	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends:** L-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ASSIGNMENTS/CASE STUDIES

Students have to write Journals on following Topics -	
Sr. No.	**Name of Practical/ Exercise/ Assignment/ Case Study**
1	Radiographic Techniques of Cervical Spine AP & Lat Views
2	Radiographic Techniques of Cervical Spine Oblique Views
3	Radiographic Techniques of Dorsal Spine AP & Lat Views
4	Radiographic Techniques of L. S. Spine AP & lat Views
5	Radiographic Techniques of SI Joints
6	Radiographic Techniques of Pelvis with both Hip joints AP View
7	Radiographic Techniques of Skull AP View
8	Radiographic Techniques of Skull PA View
9	Radiographic Techniques of Skull Lat View
10	Radiographic Techniques of Skull Townes View
11	Radiographic Techniques of Skull Caldwell View
12	Radiographic Techniques of Skull Waters View
13	Radiographic Techniques of Schuler's View
14	Radiographic Techniques of Mandible Lat Oblique
15	Dental Radiography
16	OPG

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours
I	**Radiographic Techniques of Cervical spine** positioning & technical factor	**06**
II	**Radiographic Techniques of Dorsal spine** positioning & technical factor	**09**
III	**Radiographic Techniques of L.S. Spine.** positioning & technical factor	**09**
IV	**Radiographic Techniques of Pelvic girdle** positioning & technical factor	**06**
V	**Radiographic Techniques of Skull** positioning & technical factor	**09**
VI	**Radiographic Techniques of Facial Bones & Dental Radiography** positioning & technical factor	**09**
Total		**48**

7. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Clark's Positioning in Radiology	S. Whitley, C. Sloane, Hoadley, A. Moore, C. Alsop.	Hodder Arnold, London.
2	Merrill's Atlas of Radiographic Positioning & procedures	Frank, long, Smith	Mosby, Elsevier
3	Textbook of Radiology for Residents and Technicians	Satish K Bhargava	CBS Publishers, Delhi

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY

PROGRAMME CODE : RZ

SEMESTER : THIRD

COURSE TITLE : CONTRAST & SPECIAL RADIOGRAPHY PROCEDURES

COURSE CODE : 28309

1. RATIONALE

This subject, Contrast & Special Radiography Procedures, is designed for the students to get familiarize with the Special procedures pertaining to the body systems.

2. COMPETENCY

Role of imaging technologist is in special procedures as well as routine projections in the radiological procedures.

3. COURSE OUTCOMES

On completion of this subject, students shall be able to

- Describe basic and technological aspects of Special procedures
- Describe the severity of contrast reactions and their appropriate treatment
- Determine appropriate patient interaction and preparation for all Radiographic examinations.
- Specify various advanced procedures.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--

***(*):** Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.*

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**Contrast Media-** Introduction, properties of contrast agent, types of contrast, contrast reaction & remedies, Emergency trolley.	06	10
II	**Alimentary tract Procedures** Barium studies Positioning & technical factor	09	12
III	**Urological procedures** IVP, MCU & RGU Positioning & technical factor	09	12
IV	**Mammography** -Positioning & technical factor	09	12
V	**Dental Radiography, OPG & DEXA** - Positioning & technical factor	09	12
VI	**Other Radiological Procedures** Introduction to- Myelography, Silography, Fistulography,Hystero Salpangiography	06	12
Total		48	70

7. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Contrast Media-	06	03	03	04	10
II	Alimentary tract Procedures	09	04	04	04	12
III	Urological procedures	09	04	04	04	12
IV	Mammography	09	04	04	04	12
V	Dental Radiography, OPG & DEXA	09	04	04	04	12
VI	Other Radiological Procedures	06	04	04	04	12
Total		**48**	**23**	**23**	**24**	**70**

Legends: R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)
Note: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

8. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Radiological Procedures A Guideline	Bhushan Lakhkar	Arya Publications
2	A Guide to Radiological Procedures	Chapman, Nakienly	Jaypee Brothers, Delhi

PROGRAMME NAME : **ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY**

PROGRAMME CODE : **RZ**

SEMESTER : **THIRD**

COURSE TITLE : **QUALITY CONTROL IN RADIOLOGY & RADIATION SAFETY**

COURSE CODE : **28310**

1. RATIONALE

This subject, Quality Control in Radiology & Radiation Safety, is designed for the students to understand the Quality Control in Radiology biological effects of ionizing radiation, radiological safety, radiation protection & personnel monitoring.

2. COMPETENCY

Knowledge of providing Quality & patient care during diagnostic imaging.

3. COURSE OUTCOMES

On completion of this subject, students shall be able to:

- Apply basic methods of radiation protection in diagnostic radiology.
- Should take all precautions in the protection of staff and patient

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme												
				Theory							Practical					
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	1	--	4	1.5	70*#	35	30*	00	**100**	50	--	--	--	--	--	--

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends:** L-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. TUTORIAL ASSIGNMENTS

Tutorials should be planned to enhance learning. The faculty shall decide suitable assignments minimum one per unit based on the curriculum.

6. THEORY COMPONENTS

The following topics/subtopics should be taught and assessed in order to attain the identified competencies.

Unit	Topic and Contents	Hours	Marks
I	**Radiographic image Quality** Components in image quality. Aim of quality assurance in medical imaging. Quality Assurance Programme Quality assurance tests.	06	10
II	**Biological effects of Radiation** Sources of exposure in environment. Somatic & Genetic effects. Effects on cellular levels. Effects on organs Stochastic and non-stochastic effects	12	12
III	**Radiation quantities and Units** Activity. Exposure. Kerma. Absorbed Dose. Equivalent Dose Effective Dose.	06	12
IV	**Radiation Protection** Principles of time, distance and shielding. Half value thickness. Protective devices	12	12
V	**Personnel Monitoring.** Maximum permissible levels for radiation workers and general public. ICRP recommendation. TLD, Dosimeter	06	12
VI	**Planning of Radio-diagnosis Department** Planning of the department Installation of Radiological Equipments AERB Registration process Radiological Safety Officers, roles and responsibilities National/International agencies associated in radiation safety	06	12
Total		**48**	**70**

7. SUGGESTED SPECIFICATION TABLE FORQUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Radiographic image Quality	06	03	03	04	10
II	Biological effects of Radiation	12	04	04	04	12
III	Radiation quantities and Units	06	04	04	04	12

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
IV	Radiation Protection	12	04	04	04	12
V	Personnel Monitoring.	06	04	04	04	12
VI	Planning of Radio-diagnosis Department	06	04	04	04	12
Total		**48**	**23**	**23**	**24**	**70**

Legends: R-Remember, U-Understand, A-Apply and above (Bloom's Revised taxonomy)
Note: The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

8. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Textbook of Radiological Safety	K Thayalan	Jaypee Brothers
2	Radiological Science for Technologist, Physics, Biology and Protection	Bushong, Stewart C	Mosby, St. Louis
3	Radiological Safety Division, AERB Safety code for medical diagnostic x-ray equipment and installations -- 1986 Atomic Energy Regulatory Board, Mumbai	Radiological Safety Division, AERB	Atomic Energy Regulatory Board, Mumbai

PROGRAMME NAME : ADVANCED DIPLOMA IN X-RAY RADIOGRAPHY
PROGRAMME CODE : RZ
SEMESTER : THIRD
COURSE TITLE : CLINICAL EDUCATION PART - 3 (STUDENTSHIP)
COURSE CODE : 28729

1. RATIONALE

The Clinical Education, is designed for the students to familiarize them with the applications of radiography. Student should be able to reliably perform all non-contrast plain Radiography

2. COMPETENCY

Identify the Anatomy to me Imaged, properly position the patient for Imaging;correctly select appropriate projection/projections to demonstrate the area of interest Use appropriate radiographic parameters

3. COURSE OUTCOMES

On completion of this subject, the student should be able to:

- Correctly Identify the Anatomy to me Imaged.
- To properly position the patient for Imaging
- Correctly select appropriate projection/projections to demonstrate the area of interest
- Use appropriate radiographic parameters to produce a radiograph with satisfactory results
- Differentiate a properly positioned and exposed radiograph from a wrongly positioned and over or underexposed radiograph.
- Correctly identify anatomical features displayed in radiograph obtained.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit	Examination Scheme													
				Theory							Practical						
L	T	P	(L+T+P)	Paper Hrs.	ESE		PA		Total		ESE		PA		Total		
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
--	--	18	18	--	--	--	--	--	--	--	100#	50	100	50	**200**	100	

(*): Under the theory PA, 30 marks is the average of 2 class tests of 30 marks each to be taken during the semester for the assessment.

***(#$) or (@$)** : Under the practical ESE - 50 Marks (100%)*
1) 30 Marks (60%) - For Practical – ESE
2) 20 Marks (40%) - Average of 2 Skill tests / Practicals of 30 marks each is to be conducted during the semester, and then should be converted to 20 marks.

Note: If student Remaining absent in PR-ESE shall be considered as ABSENT in PR-ESE

***Legends: L**-Lecture, **T** – Tutorial/Teacher Guided Theory Practice, **P** –Practical, **ESE** -End Semester Examination, **PA** - Progressive Assessment*

*@Internal Assessment, #External Assessment, *#Online Examination*

5. LIST OF PRACTICALS/ EXERCISES/ASSIGNMENTS/CASE STUDIES

Students have to do hands on practice on following Radiographic positioning & Radiographic Techniques on -	
Sr. No.	**Name of Practical/ Exercise/ Assignment/ Case Study**
1	Upper limb
2	Lower limb
3	Shoulder girdle
4	Thorax
5	Abdomen
6	Vertebral column
7	Pelvic girdle and hip region
8	Skeletal survey
9	Skull
10	Facial Bones

6. GENERAL GUIDELINES FOR Clinical Education (Studentship)

The Institutes/Hospitals/Diagnostic Centers can be Government, Public limited, private enterprises or ownership.

- **Duration of Industrial Training**: 18 Hours for 16 weeks as per the credits of the programme
- **Training Area:** Students should be trained in Large and Medium scale Hospitals/Diagnostic Centers. However, despite the best efforts by the Institute, if large and medium scale Hospitals/Diagnostic Centers are not available to all students then, students can also be placed in Small scale Institutes/Hospitals/Diagnostic Centers.
- **Skill Knowledge Partner (SKP) :**To be identified by the Institute as per their programme areas like

1. Government Hospitals.
2. Corporate Hospitals
3. Private Hospitals
4. Diagnostic Centers
5. Any other relevant industry

7. EXPECTATIONS FROM Skill Knowledge Partner(SKP)

Helping institute in developing the following competencies among students

- Soft Skills i.e. Communication, Presentation and others.
- Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others
- Hands-on Practices i.e. Patient Safety, Radiography and Quality Assurance aspects.

8. ROLE OF PARENT DEPARTMENT OF THE INSTITUTE

- Collecting information about Hospitals/Diagnostic Centers available for training along with capacity.
- Institutions have to enter in to MOU with number of SKPs (Institutes/Hospitals/Diagnostic Centers) for accommodating all the enrolled students for the mandatory
- Student and mentor allocation as per the slots available for Hands on training (Desirable mentor- student ratio is 1:10).
- Communication with Institutes/Hospitals/Diagnostic Centers available for training along with capacity and its confirmation.
- Student enrollment for training.
- Issuing letter to the Institutes/Hospitals/Diagnostic Centers for the training along with details of students and mentors.
- Principal/ HOD/ Faculty should address students about safety norms, rules and discipline to be maintained in the Institutes/Hospitals/Diagnostic Centers during the training before relieving students for training.
- The faculty member during the visit to Institutes/Hospitals/Diagnostic Centers will check the progress of the student in the training, his/ her attendance, discipline, log book preparation &project report preparation
- Mentors to carry out progressive assessment of the students during the training through Progressive Assessment (PA).
- End Semester Examination (ESE) assessment by mentor along with Institutes/Hospitals/Diagnostic Centers expert as external examiner

9. ROLES AND RESPONSIBILITIES OF THE STUDENTS

Following should be informed to students in the letter deputing them for the training; an undertaking for this should also be taken from them

- Students would interact with the mentor to suggest choices for suitable Institutes/Hospitals/Diagnostic Centers. If students have any contact in Institutes/Hospitals/Diagnostic Centers (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
- Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the Institutes/Hospitals/Diagnostic Centers on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
- He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Institutes/Hospitals/Diagnostic Centers and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
- Students should know that if they break any rule of Institutes/Hospitals/Diagnostic Centers or do not follow the discipline then Institutes/Hospitals/Diagnostic Centers can terminate the training and send back the student.

- It is the responsibility of the student to collect information from Institutes/Hospitals/Diagnostic Centers about Radiography procedures/ Patient Safety /work ethics/professional practices/organizational structure etc.
- During the training period students have to keep daily record of all the useful information in Log book
- Maintain the Diary/Logbook and get it signed from mentor as well as Institutes/Hospitals/Diagnostic Centers Training in-charge.
- In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
- Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as Institutes/Hospitals/Diagnostic Centers training in-charge.

10. FORMAT FOR TRAINING REPORT

Following is the suggestive format for the training report; actual format may differ slightly depending upon the nature of Institutes/Hospitals/Diagnostic Centers. The training report may contain the following

- Title page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1. Organizational structure of Institutes/Hospitals/Diagnostic Centers and General Lay Out.

Chapter 2. Introduction of Institutes/Hospitals/Diagnostic Centers(History, Facilities available. Specialization and number of employees etc.)

Chapter 3. Types of major equipment/instruments/ machines used in Radiology with their specification, approximate cost and specific use and their routine maintenance.

Chapter 4. Standard Operating procedures.

Chapter 5. Quality assurance procedures.

Chapter 6. Equipment handling and procedures.

Chapter 7. Safety procedures followed

Chapter 8. Particulars of Practical Experiences in Radiology

Chapter 9. Short report/description of the project (if any done during the training)

Chapter 10. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

- References /Bibliography

11. SUGGESTED LEARNING STRATEGIES

Students should visit the website of the Institutes/Hospitals/Diagnostic Centers where they are undergoing training to collect information about Facilities, Specialization, capacity, number of employees, etc. They should also refer the operating manuals of the major machines and operation, testing, quality control and standard operating procedures and practices used in the Radiology. Students may also visit websites related to other similar industries as their learning resource.The training activity may vary according to nature and size of Institutes/Hospitals/Diagnostic Centers. The details of activities to be completed during 16 weeks should be planned appropriately. The evaluation of Clinical Education (Studentship)will be done on the basis of skills acquired by the student during this 16 weeks period.

ASSESSMENT SCHEME FOR CLINICAL EDUCATION (STUDENTSHIP)

Training duration	END SEMESTER ASSESSMENT (Practical and Oral)		PROGRESSIVE ASSESSMENT (Weekly report of all 16 week and attendance)		Total marks	
Sixteen Weeks	Max. marks	Min. marks	Max. marks	Min. marks	Max. marks	Min. marks
	100#	50	100	50	200	100

External Assessment

EVALUATION SHEET FOR CLINICAL EDUCATION (STUDENTSHIP)

Sr. No.	Enrollment Number	Name of Student	Marks by Mentor & Industry Supervisor jointly	Marks by Industry Supervisor	Marks by Mentor Faculty	Total Marks
			Out of 40 (A)	Out of 30 (B)	Out of 30 (C)	Out of 100 (A+B+C)

DISTRIBUTION OF END-SEMESTER-EXAMINATION (ESE) MARKS OF CLINICAL EDUCATION (STUDENTSHIP)

Marks for Training Report	Marks for Practicals	Marks for Oral/Viva-voce	Total ESE marls
25	25	50	100