MEDICAL LABORATORY TECHNICIAN (RADIOLOGY)

COMPETENCY BASED CURRICULUM

(Duration: 1 Yr. 3 Months)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – HEALTHCARE AND WELLNESS

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

MEDICAL LABORATORY TECHNICIAN (RADIOLOGY)

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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1. SSG Hospital Vadodara
2. Indian Institute of Medical Technology
3. Indu College of Medical Science
4. Toprani Lab

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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Medical Laboratory Technician (Radiology) trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of one year three months (01 Block of 15 months duration including basic training) duration. In the Domain area Trade Theory & Practical impart professional - skills and knowledge and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

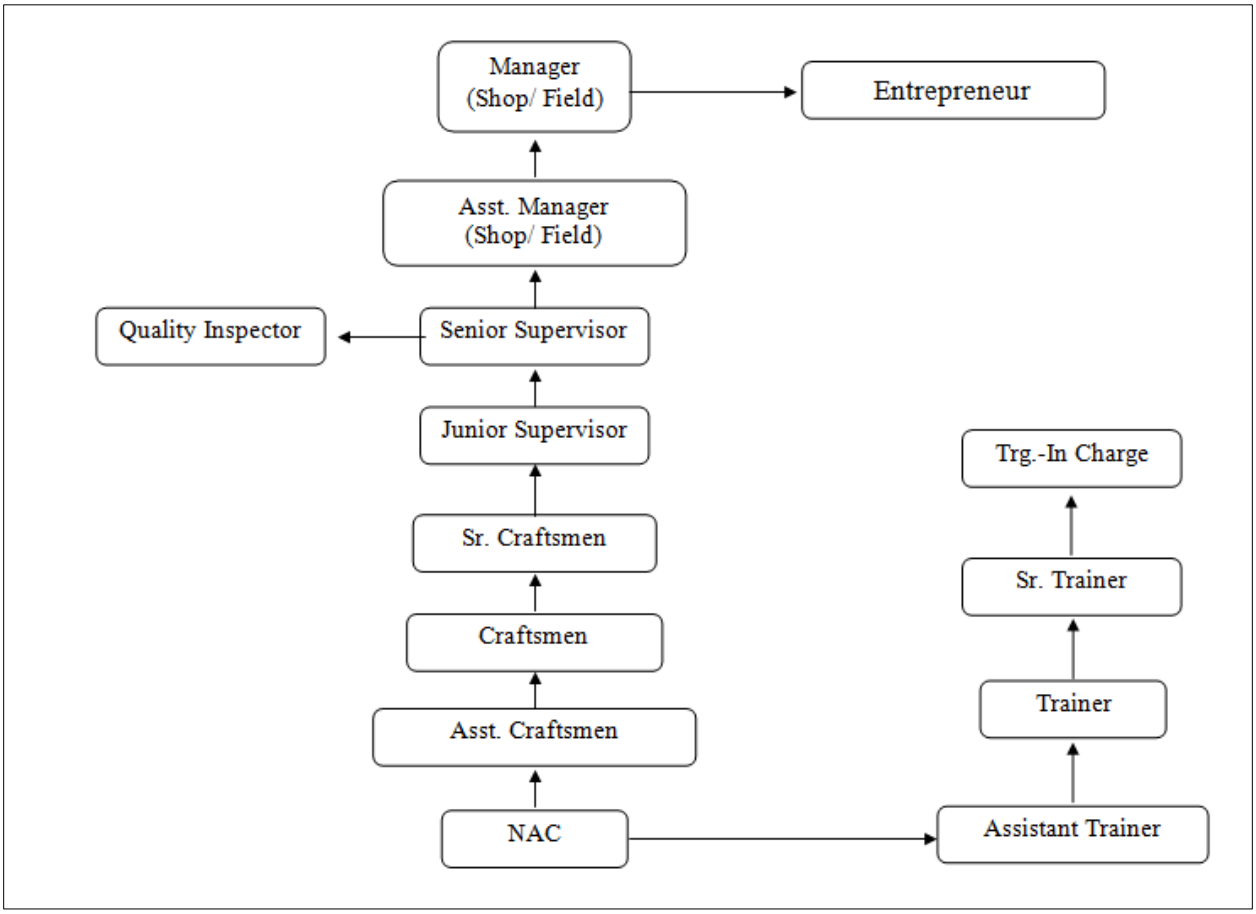
Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Document the technical parameters related to the task undertaken.
- Arrange and sets various instruments and apparatus in X-ray skiagraphs (Photographs) for diagnosis of ailments or gives ray treatment by operating X-ray equipment and exposing patient to rays.

Medical Laboratory Technician (Radiology)

2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

Total training duration details: -

Time (in months)	**1-3**	**4-15**
Basic Training	**Block– I**	**-----**
Practical Training (On - job training)	**----**	**Block – I**

A. Basic Training

For 02 yrs. course (Non-Engg.) :- **Total 06 months:** 03 months in 1st yr. only.

For 01 yr. course (Non- Engg.) :- **Total 03 months:** 03 months in 1st yr.

Sl. No.	Course Element	Total Notional Training Hours (For 01 yr. Course)
1	Professional Skill (Trade Practical)	270
2	Professional Knowledge (Trade Theory)	120
3	Employability Skills	110
	Total (including Internal Assessment)	**500**

B. On-Job Training:-

For 01 yr. course (Non- Engg.):- (**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Non- Engg.)	500 hrs.	3640 hrs.	4140 hrs.
For 01 yr. course (Non- Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

After completion of the course the apprentices shall be qualified for one or more of the following job roles:

Take X-ray skiagraphs (Photographs) for diagnosis of ailments or gives ray treatment by operating X-ray equipment and exposing patient to rays. Arrange the set up, prepare patient by self or by Nurse for ray exposure. Regulate duration and intensity of exposure by adjusting machine and exposes patient to rays as directed by Radiologist. Position patient on X-ray couch to ensure correct exposure of part of body required to be X-rayed and for ray exposure taking care to protect patient and himself from harmful exposure to X-ray. Adjust X-ray tube at proper distance and angle, by rotating pivot etc. to ensure centering of tube on part of body to be X-rayed. Regulates controls of X-ray machine or therapy equipment, for duration intensity of exposure and exposes film or patient to rays as directed by Radiologist. Remove cassette with exposed film and hands over to Dark Room Assistant where available for developing fixing, washing, labelling (date and name of patient) etc. mixes develops fixers etc. and processes X-ray films in accordance with techniques and instruction of Radiologist. Keep the records of raw and exposed films, spare parts and of patients X-rayed or treated. Mix developers and process film in accordance with prescribed techniques.

Reference NCO-2015: 3211.0100 - X-Ray Technician

4. NSQF LEVEL COMPLIANCE

NSQF level for Medical Laboratory Technician (Radiology) trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. Professional knowledge
c. Professional skill
d. Core skill and
e. Responsibility.

The Broad Learning outcome of Medical Laboratory Technician (Radiology) trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	Medical Laboratory Technician (Radiology)
NCO - 2015	3211.0100 X-Ray Technician
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	3 months + One year (01 Block of 15 months duration including basic training).
Duration of Basic Training	a) Block –I : 3 months **Total duration of Basic Training: 3 months**
Duration of On-Job Training	a) Block–I: 12 months **Total duration of Practical Training: 12 months**
Entry Qualification	Passed 12th Class Examination under (10+2) System of Education with Physics, Chemistry & Biology.
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trades of ITI.
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	NIL
CTS trades eligible for Medical Laboratory Technician (Radiology) Apprenticeship	N/A

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the Medical Laboratory Technician (Radiology) course of 01 years duration under ATS.

Block I:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
3. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
4. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
5. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1	Identify different parts of the human body.
2	Demonstrate with Models and A.V. Show.
3	Exam a patient by following prescribed steps.
4	Identify the parts of X-Ray Tube. Practice on operation of X-Ray Tube, taking various safety measures.
5	Set up of X-Ray Dark-room.
6	Design of loading bench.
7	Prepare solution and storage of dry chemicals.
8	Prepare film plates for taking X-Rays.
9	Prepare patient for general X-Ray examination and also various special investigations.
10	Place and adjust the film plates on frame.
11	Prepare and adjust of X-Ray machines.
12	Take X-Ray.
13	Rinse, Wash and Dry plates using different methods.
14	Take day to day care and maintenance of the equipments.

Note: *Learning outcomes are reflection of total competencies of a trainee and assessment will be carried out as per assessment criteria.*

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1. 1. Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1. 2. Recognize and report all unsafe situations according to site policy.
	1. 3. Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1. 4. Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1. 5. Identify and observe site policies and procedures in regard to illness or accident.
	1. 6. Identify safety alarms accurately.
	1. 7. Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1. 8. Identify and observe site evacuation procedures according to site policy.
	1. 9. Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1. 10. Identify basic first aid and use them under different circumstances.
	1. 11. Identify different fire extinguisher and use the same as per requirement.
	1. 12. Identify environmental pollution & contribute to avoidance of same.
	1. 13. Take opportunities to use energy and materials in an environmentally friendly manner
	1. 14. Avoid waste and dispose waste as per procedure
	1. 15. Recognize different components of 5S and apply the same in the working environment.
2. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day	2.1 Explain the concept of productivity and quality tools and apply during execution of job.
	2.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain

work to improve productivity & quality.	sensitive towards such laws.
	2.3 Knows benefits guaranteed under various acts
3. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	3.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	3.2 Dispose waste following standard procedure.
4. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	4. 1. Explain personnel finance and entrepreneurship.
	4. 2. Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	4. 3. Prepare Project report to become an entrepreneur for submission to financial institutions.
5. Plan and organize the work related to the occupation.	5. 1. Use documents, drawings and recognize hazards in the work site.
	5. 2. Plan workplace/ assembly location with due consideration to operational stipulation
	5. 3. Communicate effectively with others and plan project tasks
	5. 4. Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME	
Block-I	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **Block – I** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*	

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills& Basic Numeracy (270 Hours)	Professional Knowledge (120 Hours)
1-3	Demonstration of Human Skeleton : ▪ Anatomical Position ▪ Axis ▪ Plane ▪ Identification of various bones& joints ▪ Demonstration of movement possible at various joints	**Anatomy:** Regions of the body. Bones and joints; General structures and forms; Important ligaments and muscular attachments. Skull, spine, pelvis, bones of upper and lower extremities. Structure of atypical joint and general descriptions of main joints. Synovial fluid, movements in joints and their limitation; chief relation, group movements of joints. **Thorax and Abdomen:** Structure of thoracic cage, abdominal cavity. Diaphragm and Mediastinum. Heart and vessels. Structure and function of heart. **Respiratory System:** Accessory nasal sinuses, Larynx, trachea, bronchi, lungs, pleura.
4-6	Characteristic features, side determination & applied anatomy of : • Upper Limb bones: a. Scapula b. Clavicle c. Humerus d. Radius e. Ulna • Lower Limb bones: a. Hip b. Femur c. Tibia d. Fibula • Review of Anatomy, Physiology & Related Pathology i.e. Surface Marking & Identification of various parts and structures in of Human	**Alimentary System:** Mouth, tongue, salivary glands, pharynx, tonsils, oesophagus, stomach, small and large intestine, liver and biliary tract, spleen, pancreas, mesentery, omentum. Urinary tract; Kidney, ureters, bladder and urethra. **Reproductive System:** Female and Male tract – fallopian tubes, ovaries, uterus, mammary gland. Tests of gonads. **Nervous System:** Bones of skull – General features. Names and position of bones of vault and base (articulatedony). Vertebral column – structure of a typical vertebra, Altas Axis, Sacrum and coccyx. Brain – main sub-divisions and lobes ventricles, spinal cord. Surface anatomy in relation to Radiography. Ductless glands.

	Body • Identify bones and parts on X-Ray Film • X-Ray Equipment for Radiographers • X-Ray tubes and general features and • Mobile equipment • Image Intensifier • Care and Maintenance of X-Ray equipment	Basic idea of X-Ray , Generation of X-Ray., its characteristics, Photoelectric effect, Compton effect, Fluorescence, Phosphorescence Production of X Ray, X Ray Tubes, Design. Diagnostic H T circuits, H T generators, Measuring Instruments. Scattered radiation: Control of Scattered radiation, cones diaphragms, filters. Interaction of X –ray with mater, Energy absorption from x – rays, measurement of x- rays, Roentgen and Rad, Simple principle of Dosimeter, Fluorescent effect, photographic effect.
7-12	• To study effects of KV and MAS. • Demonstration of radiation safety devices • To Survey X-Ray control for Radiation • X-Ray intensifying Screens • Demonstrate the uses of grid, potter • Bucky and Radio graphic contrast • Demonstrate effects of improper ○ centering of X-Ray tube • Radiation field coincidence. • Basics of Imaging • Radiographic dark room techniques • Radiographic positioning • Special Investigations Radiography in various position for all the special radiological procedures, using contrast media as per syllabus	Protection: Code of practice for the protection of person against ionising radiation, protective materials, lead, lead equivalent, building material, personnel monitoring, international recommendations against hazards of ionising radiation. Radiographic photography and dark room technique : X – Ray materials: types of emulsion characteristic and control, screen and non-screen films, dental films, X-ray paper under and over exposure, speed contrast. Intensifying screen: Fluorescence, application of fluorescence in radiography, types of intensifying screens, intensifying factors, cleaning and general care of screen-after glow. X-ray cassettes: testing for proving good screen contact, general care. X-ray developers: Characteristics, details and contrast freedom from chemical fog and staining, function and constituent of developers, standardization of time and

		temperature, exhaustion of developers, Replenisher. X-ray fixer and fixing: fixing agents, acids and preservative in fixer, inclusion of hardener, time of fixation, silver recover. Rinsing, washing and drying: Object, methods employed, method of drying films. Processing methods, method of preparation of solution, nature of mixing order mixing solution filtration, solution. X-ray Dark room, size, light proof entrance, hatches, construction of walls for protection against chemicals and radiation, ceiling, colour schemes, water proofing of floors, loading bench design, disposition of processing and accessory equipment for efficient working, arrangement of drying cabinets in dark room or in adjacent rooms, dark-room illumination and testing for safety, ventilation.
13.	**Internal Assessment 03days**	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I **(Duration – 110 hrs.)**	
1. English Literacy Duration : 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy Duration : 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.

Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills Duration : 15 Hrs. Marks : 07	
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
4. Entrepreneurship Skills Duration : 15 Hrs. Marks : 06	
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation.

	Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity Duration : 10 Hrs. Marks : 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration : 15 Hrs. Marks : 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.

First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration: 05 Hrs. Marks : 03	
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools Duration: 10 Hrs. Marks : 05	
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The competencies/ specific outcomes on completion of On-Job Training are detailed below: -

DURATION: 12MONTHS (52WEEKS)	
SL NO	**LIST OF PRACTICAL SKILLS TO BE COVERED DURING ON JOB TRAINING**
1	Identify different parts of the human body.
2	Demonstrate with Models and A.V. Show.
3	Exam a patient by following prescribed steps.
4	Identify the parts of X-Ray Tube. Practice on operation of X-Ray Tube, taking various safety Measures.
5	Set up of X-Ray Dark-room.
6	Design of loading bench.
7	Prepare solution and storage of dry chemicals.
8	Prepare film plates for taking X-Rays.
9	Prepare patient for general X-Ray examination and also various special investigations.
10	Place and adjust the film plates on frame.
11	Prepare and adjust of X-Ray machines.
12	Take X-Ray.
13	Rinse, Wash and Dry of plates using different methods.
14	Take day to day care and maintenance of the equipments.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.

2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

MEDICAL LABORATORY TECHNICIAN (RADIOLOGY)			
LIST OF EQUIPMENTS & TOOLS for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Radiation protection toolkit		As req.
2.	Lead apron		As req.
3.	Lead markers		As req.
4.	Lead gloves		As req.
B. TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS			
5.	Cassettes all sizes		1 no.
6.	Screen all sizes		1 no.
7.	Hanger all sizes		1 no.
8.	Dark room with accessories		As req.
9.	Lead divider		1 no.
C: GENERAL MACHINERY INSTALLATIONS:-			
10.	X-Ray Machine		1 no.

Note: *In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.*

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness (15)	Workplace hygiene (5)	Attendance/ Punctuality (10)	Ability to follow Manuals/ Written instructions (5)	Application of Knowledge (10)	Skills to handle tools & equipment (10)	Economical use of materials (5)	Speed in doing work (10)	Quality in workmanship (15)	VIVA (15)	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														