

1	Name of Course	Certificate Course in Maintenance of X-Ray Machine (301111)																																															
2	Max. Nos. of Student	25 Students																																															
3	Duration	6 Months																																															
4	Type	Part Time																																															
5	Nos. of Days / Week	6 Days																																															
6	Nos. of Hours /Days	4 Hrs																																															
7	Space Required	Theory Class Room – 200 sqft Practical – 400 sqft																																															
8	Entry Qualification	H.S.C. (Science)																																															
9	Objective Of Syllabus/ introduction	After completion of this course the participant will • Should able to use multimeter • Should be able to test electrical earth, test & replace faulty power chord, test hightension cables cables, test • Test fuse in the equipment and replace them when requ																																															
10	Employment Opportunity	Can work as X-ray Machine Maintenance Technician in various Hospitals, Nursing Home, Medical Service Institutions etc.																																															
11	Teacher’s Qualification	Min 1 year Experience of X-ray Operator + B.A. or B.Com, With computer competency for theory subject																																															
12	Training System	<table><tr><th colspan="7">Training System Per Week</th></tr><tr><td colspan="2">Theory</td><td colspan="2">Practical</td><td colspan="3">Total</td></tr><tr><td colspan="2">6 hrs</td><td colspan="2">18hrs</td><td colspan="3">24hrs</td></tr></table>						Training System Per Week							Theory		Practical		Total			6 hrs		18hrs		24hrs																							
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SYLLABUS

Theory - I

X-Ray Machine Maintenance

- Multimeter and its application
- Basics of electricity – define DC, AC //practical measuring units of voltage,current, resistance.
- Use of line-tester
- Testing of earth using test lamp
- Testing of earth using multimeter
- Basic Electronics – passive and active components, testing of components,
- Op-Amp – Introduction, applications, construction, differential amplifier, biomedical amplifier, filters – integrator, differentiator, notch filters, comparators
- Digital electronics – gates and its application, multiplexers, de-multiplexers, counters
- Layout of a x-ray room, safety features required
- Fuse – use, types used in X-Ray Machine, ratings
- Switches and interlocks, relay, circuit breakers in x-ray machine
- Power cord maintenance, changing broken 3-pin plug
- high tension cables & its precautions
- General care and maintenance for mobile x-ray machine and stationary x-ray machine
- Operation of X-Ray Machine
- block diagram of x-ray machine, Common PCB's and identification of PCB's, fuses in the PCB
- performance of x-ray machine –use of spinning top, wisconsin test tool, aluminium test wedge, dosimeter , Wisconsin test cassette
- non-invasive x-ray QC device – use, operation
- bucky tray and its maintenance
- x-ray tube – types, working, rating chart, faults in x-ray tube, tube housing
- collimator – use, construction, bulb in collimator – rating & replacement

Practical - II

X-Ray Machine Maintenance

Practice procedures for safety and health hazards measures Electrical and personal safety, dangers and preventions

- a. Operate Multimeter & Measure Resistance, voltage, current
- b. Use line-tester,
- c. Perform power chord maintenance of equipments
- d. Test earth using test lamp or multimeter
- e. Replace fuse in the equipment and replace them when required
- f. Test switches, interlocks, magnetic relay, and circuit breakers and replace
- g. Maintain patient table, tube stands and tracks
- h. Test the performance of X-ray Machine , test exposure timer, mille ampere testing, kilo voltage testing
- i. Test the performance using non-invasive x-ray QC device
- j. Maintaining of log book
- k. List out the tools required for performing maintenance
- l. X-ray tube housing – maintenance
- j. Replacemen of fused bulb in Collimator
- k. Follow dismantling procedure open the equipment and replace the faulty board

Resources

1. x-ray machine (mobile)
2. x-ray machine (stationary)
3. performance test tools
4. non-invasive x-ray QC device

Practical – I

Basic Electronics

- Practice procedure for electrical and personal safety measures
- Use of multimeter
- Testing of active and passive components
- Testing of transformers
- Testing of semiconductor components
- Testing of unregulated and regulated voltages
- Soldering and de-soldering techniques
- Assemble and test rectifier circuits – half wave, full wave & bridge rectifier
- Assemble a power amplifier circuit (ce, emitter follower)
- Assemble and test an audio power amplifier (buzzer)
- Construct a RC- oscillator and test it
- Opening & dismantling an equipment and identifying the major parts , testing of major components, identifying transformers and checking , checking of power modules, Charging , discharging and testing of batteries, repairing of SMPS, simulating various faults diagnosing and rectifying it.

Equipment List ;

Technicians tool kit

Digital multimeter

Clip on ammeter

Soldering gun

Desoldering pump

Soldering / desoldering temp controlled station

SMD soldering tools

Antistatic mat with proper grounding and wrist band