

**B.Voc PROGRAM (4 years Honors)
2020-21 onwards**

SUBJECT
MEDICAL TECHNOLOGY (MT)

Members of BOS(Contact details)		
Dr. P. Vijaya Nirmala	Asst. Professor, Department of Zoology, Adikavi Nannaya University	9441140857
Dr. B. Anuradha,	M.D., Prof& HOD of Radio Diagnosis , RMC Kakinada.	8074510369
Dr. K Samba Siva Rao	Assoc. Professor, RMC, Kakinada.	8919220811
Dr.S.Sowbhagya lakshmi	M.D., Prof& HOD of Anesthesiology ,Vice principal RMC Kakinada	9848063806
Dr. M.Santhi Sree	Assoc. Professor, RMC, Kakinada	7702322194
Dr Viswanath Patnala	Oncologist, Chandra Kala superspeciality hospital, Danavaipeta. Rajahmundry	08099322555
Dr. N. Sreenivas	Asst. Professor, Department of Zoology, P R Government College (Autonomous), Kakinada	9912760880
Mrs.S.Likhita	Asst proff,PVRT degree college,Kakinada	9505700254

TABLE OF CONTENTS

S. No	Particulars	Page No.
1	Resolutions of the BOS	3
2	Details of paper titles & Credits	6
	a. Proposed combination subjects:	7
	b. Student eligibility for joining in the course:	7
	c. Faculty eligibility for teaching the course	7
	d. List of Proposed Skill enhancement courses with syllabus, if any	7
	e. Any newly proposed Skill development/Life skill courses with draft syllabus and required resources	7
	f. Required instruments/software/ computers for the course	7
	g. List of Suitable levels of positions eligible in the Govt/Pvt organizations	8
	h. List of Govt. organizations / Pvt companies for employment opportunities or internships or projects	9
	i. Any specific instructions to the teacher /paper setters/Exam-Chief Superintendent	10
3	Program objectives, outcomes, co-curricular and assessment methods	10
4	Details of course-wise syllabus for Theory and Lab	14
5	Details of Syllabus on Skill Enhancement courses and Model Question Papers for Theory and Lab	22

Note: BOS is to provide final soft copy in PDF and word formats and four copies of hard copies in bounded form to the office of Dean Academic affairs.

1. Resolutions of the Board of Studies

Meeting held on 22-01-2010

Time: 10:00 AM

At: N.T.R Convention Centre,
Adikavi Nannaya University, Rajamahendravaram

Agenda:

1. Adoption of revised-common program structure and revising/updating course-wise syllabi (in the prescribed format) as per the guidelines issued by APSCHE
2. Adoption of regulations on scheme of examination and marks/grading system of the UG program
3. Preparation of Model question papers in prescribed format
4. List of equipment / software requirement for each lab/practical
5. Eligibility of student for joining the course
6. Eligibility of faculty for teaching the course
7. Any specific instructions to the teacher/paper-setter/student/ chief-superintendent/ paper-evaluator
8. List of paper-setters/paper evaluator with phone, email-id in the prescribed format

Members present:

1. Dr. P. Vijaya Nirmala, Asst. Professor, Department of Zoology, Adikavi Nannaya University
Chairperson
2. Dr. B. Anuradha , M.D., Prof& HOD of Radio Diagnosis , RMC Kakinada *Convenor.*
3. Dr. K Samba Siva Rao, Assoc. Professor, RMC, Kakinada *Member.*
4. Dr. S. Sowbhagya lakshmi, M.D., Prof& HOD of Anesthesiology , Vice principal RMC Kakinada
Member
5. Dr. M. Santhi Sree, Assoc. Professor, RMC, Kakinada *Member*
6. Dr Viswanath Patnala, Oncologist, Chandra Kala superspeciality hospital, Danavaipeta.
Rajahmundry *Member*
7. Dr. N. Sreenivas, Assistant Professor in Zoology, P R Government College (Autonomous),
Kakinada *Coordinator*
8. Mrs. S. Likhita, Asst proff, PVRT degree college, Kakinada *Member*

Resolutions: As per the **National Education Policy, 2019** the **outcomes of Higher Education** include increased critical thinking abilities, higher order thinking and deeper learning, mastery of content, problem solving, team work and communication skills besides general engagement and enjoyment of learning including systematic research in India.

The overall objectives of the learning outcomes-based curriculum framework are to:

Help formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes that are expected to be demonstrated by the holder of a qualification;

Enable prospective students, parents, employers and others to understand the nature and level of learning outcomes (knowledge, skills, attitudes and values) or attributes a graduate of a programme should be capable of demonstrating on successful completion of the programme of study.

The board of studies meeting in Medical Image Technology (M.I.T.), Medical technology (M.T.) and Critical Care Management (C.C.M.) courses for B.Voc. For the academic year 2020-21 held virtually through google meet on 23.11.2021 at 6pm with Dr. P. Vijaya Nirmala, Asst. Professor, Department of Zoology, Adikavi Nannaya University as a chairperson along with following members.

Members present:

1. Dr. P. Vijaya Nirmala, Asst. Professor, Department of Zoology, Adikavi Nannaya University *Chairperson*
2. Dr. B. Anuradha, M.D., Prof & HOD of Radio Diagnosis, RMC Kakinada *Convenor*.
3. Dr. K Samba Siva Rao, Assoc. Professor, RMC, Kakinada *Member*.
4. Dr. S. Sowbhagya Lakshmi, M.D., Prof & HOD of Anesthesiology, Vice principal RMC Kakinada *Member*
5. Dr. M. Santhi Sree, Assoc. Professor, RMC, Kakinada *Member*
6. Dr. Viswanath Patnala, Oncologist, Chandra Kala superspeciality hospital, Danavaipeta. Rajahmundry *Member*
7. Dr. N. Sreenivas, Assistant Professor in Zoology, P R Government College (Autonomous), Kakinada *Coordinator*
8. Mrs. S. Likhita, Asst. prof, PVRT degree college, Kakinada *Member*

The Chairperson, convenor and other members have discussed various aspects in syllabi (CBCS) revised by the APSCHE in 2020. It has been reviewed by the undersigned BOS committee of U.G. B.Voc., medical Courses MIT, MT and CCM in Adikavi Nannaya University, Rajahmundry. The above 3 courses and the list of external experts is submitted to the Chairperson, BOS, Medical Courses.

S.No.	Name	Designation	Signature
1.	Dr. P. Vijaya Nirmala	Asst. Professor, Department of Zoology, Adikavi Nannaya University	
2.	Dr. B. Anuradha,	M.D., Prof& HOD of Radio Diagnosis , RMC Kakinada.	
3.	Dr. K Samba Siva Rao	Assoc. Professor, RMC, Kakinada.	
4.	Dr.S.Sowbhagya lakshmi	M.D., Prof& HOD of Anesthesiology ,Vice principal RMC Kakinada	
5.	Dr. M.Santhi Sree	Assoc. Professor, RMC, Kakinada	
6.	Dr Viswanath Patnala	Oncologist, Chandra Kala superspeciality hospital, Danavaipeta. Rajahmundry	
7.	Dr. N. Sreenivas	Asst. Professor, Department of Zoology, P R Government College (Autonomous), Kakinada	
8.	Mrs.S.Likhita	Asst proff ,PVRT degree college,Kakinada	

2. Curriculum Framework

BACHELOR OF VOCATION
MEDICAL TECHNOLOGY (MT)
COURSE STRUCTURE AND SYLLABUS: W.E. F 2020-21 Admitted batch
1st year -Semester I

Course No.	Course Name	Mid semester	Semester final	Total marks	Teaching Hours/ Week	Credits
1	***English	25	75	100	4	3
2	***Language(H/T/S)	25	75	100	4	3
3	***Human Values and Professional Ethics (Life Skill Course)	0	50	50	2	2
4	***Tourism Guidance (Skill development courses)	0	50	50	2	2
M-1	***Inorganic and Physical Chemistry	25	75	100	4	4
	***Practical – I Analysis of Salt Mixture	0	50	50	2	1
M-2	Anatomy	25	75	100	4	4
	Lab/Practical – Anatomy	0	50	50	2	1
Core-1	Physiology	25	75	100	4	4
	Lab/Practical/OJT : Physiology	0	50	50	2	1
Core-2	Fundamentals of Biomedical instruments	0	50	50	2	2
	Lab/ practical: Fundamentals of Biomedical instruments	0	50	50	2	1
	TOTAL			850	34	28

*** As per CBCS-2021 syllabus

a. Proposed combination subjects:

BACHELOR OF VOCATION MEDICAL TECHNOLOGY (MT)

b. Student eligibility for joining in the course:

- The minimum educational qualification for admission under this scheme will be class 12 pass or equivalent from any recognized board or university.
- Equal weightage should be given to vocational subjects at +2 level while considering the students for admission into B.Voc courses for recognition of skills credits.
- Reservation to SC, ST, OBC and PwD categories will be available as per the extant National / State policy.
- There shall be no age bar for admission in the skill based certificate /diploma/ degree programmes under NSQF.
- While deciding criteria for admission into any particular trade, the institutions will consider students having background in relevant stream at 10+2 level.
- In case of certificate programmes, admissions may be done twice a year to facilitate a steady stream of learners joining the college and moving out as trained work force to the job market.

c. Faculty eligibility for teaching the course

MBBS Radiology or MS Radiology

d. List of Proposed Skill enhancement courses with syllabus, if any

e. Any newly proposed Skill development/Life skill courses with draft syllabus and required resources

f. Required instruments/software/ computers for the course (Lab/Practical course-wise required i.e., for a batch of 15 students)

Sem. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
		Anti abd blood grouping kit	Meril	2
		Neubauer chamber	Marine feld	15
		Haemometer sahlitype	M labs	15

1	Physiology	Wbc pipette	Tarsons	8
		Rbc pipette	Tarsons	8
		Microscopes	Gemkolab well	5
		Stethoscope	Indo surgicals	1
		Sphygmometer(mecurical & automatic)	Dr .morepen	1
		Glucometer strips(60)	Dr. Morepen	1
2	Anatomy	Eye,ear	Charts and models	1
		Respiratory system	Charts and models	1
		Heart	Charts and models	1
		Upper limb	Charts and models	1
		Lower limb	Charts and models	1
		Skeletal system(human)	Charts and models	1
		Gastro intestinal track	Charts and models	1
		Central nervous system	Charts and models	1
3	Fundamentals of bio medical instruments	Resistors 1k, 2.2k, 3.3k, 4.7k,10k	Cressall	EACH 5
		Diode-1n4007	Yash enterprises.	10
		Capacitor-0.01 μ f	J &s enterprises	10
		Cro	Hi tech electrical engineers	5
		Connecting wires	Syska wires	15
		Bread board	Arduino starter kits	5
		Regulated power supply	Crown electronic system	5
		Voltmeter	Klein tools	5
		Ammeter	Robin teper	5
		Multimeters	Klein tools	5
		Wein bridge kit	H. L. Scientific industries	5
		Schering's bridge kit	Sciencetech	5
		Maxwell's inductanceand capacitance bridge kit	Sciencetech	5

g. List of Suitable levels of positions eligible in the Govt/Pvt organizations

Suitable levels of positions for these graduates either in industry/govt organization like., technical assistants/ scientists/ school teachers., clearly define them, with reliable justification

S.No	Position	Company/ Govt organization	Remarks	Additional skills required, if any
1	x-ray technician	Government Hospitals, Private Hospitals, Public Health centre, Diagnostic Labs, Nursing Homes		
2	Radiology Technician	Government Hospitals, Private Hospitals, Public Health centre, Diagnostic Labs, Nursing Homes		
3	Ultrasound technician	Government Hospitals, Private Hospitals, Public		

		Health centre, Diagnostic Labs, Nursing Homes		
4	MRI Technician	Government Hospitals, Private Hospitals, Public Health centre, Diagnostic Labs, Nursing Homes		
5	CT scan Technician	Government Hospitals, Private Hospitals, Public Health centre, Diagnostic Labs, Nursing Homes		

h. List of Govt. organizations / Pvt companies for employment opportunities or internships or projects

S.No	Company/ Govt organization	Position type	Level of Position			
1	Government Hospitals	x-ray technician, Radiology Technician, Ultrasound technician, MRI Technician, CT scan Technician				
2	Private Hospitals	x-ray technician, Radiology Technician, Ultrasound technician, MRI Technician, CT scan Technician CT scan Technician				
3	Public Health centre,	x-ray technician, Radiology Technician, Ultrasound technician, MRI Technician, CT scan Technician				
4	Diagnostic Labs,	x-ray technician, Radiology Technician, Ultrasound technician, MRI Technician, CT scan Technician				
5	Nursing Homes	x-ray technician, Radiology Technician,				

		Ultrasound technician, MRI Technician, CT scan Technician				
6	Medical Equipment manufacturing & supply companies	Technician/service personal				

- i. Any specific instructions to the teacher /paper setters/Exam-Chief Superintendent

3. Program objectives, outcomes, co-curricular and assessment methods

B.VOCATION	BACHELOR OF VOCATION MEDICAL TECHNOLOGY (MT)
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1. Aim and objectives of UG program in Subject:

- To develop Ability to ensure that medical equipment is well maintained and safely functional.
- To Follow safety codes and standards, troubleshoot faulty devices and achieve appropriate skills for employment.
- To enhance the Ability to Operate & Assist technicians while operating X- Ray, CT & Ultra Sound, M.R.I equipment

2. Learning outcomes of Subject (in consonance with the Bloom's Taxonomy):

Program Outcomes (POs):

The Learning Outcomes of the programme could be in consonance with the various Imaging Techniques, which includes –

- i. Remember (Lowerorder)
 - ii. Understand (LowerOrder)
 - iii. Apply (LowerOrder)
 - iv. Analyze (HigherOrder)
 - v. Evaluate& Problem Solving (HigherOrder)
 - vi. Create new Technologies (HigherOrder)
- **Critical thinking:** Able to understand and utilize the principles of scientific enquiry, think analytically, clearly and evaluate critically while solving problems

and making decisions during various imaging and machinery problems.

- **Effective communication:** Able to formally communicate Scientific ideas and investigations of the advancements in imaging to others using both oral and written communication skills.
- **Social interaction:** Able to develop individual behaviour and influence society and social structure.
- **Effective citizenship:** Able to work with a sense of responsibility towards social awareness and follow the ethical standards in the society.
- **Ethics:** Ability to demonstrate and discuss ethical conduct in scientific activities.
- **Environment and Sustainability:** Able to understand the impact of medical science in societal and environmental contexts and demonstrate the knowledge for sustainable development.
- **Self-directed and life-long learning:** Able to recognize the need of life-long learning and engage in research and self-education.

3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work

- I. **Class-room activities:** Organization of Group discussions, question-answer sessions, scientific observations, use of audio-visual aids, guidance programmes, examination and evaluation work (scheduled and surprise tests), quizzes, preparation of question banks, student study material, material for PG entrance examination etc.
- II. **Library activities:** Reading books and magazines taking notes from prescribed and reference books and preparation of notes on lessons as per the syllabus; Reading journals and periodicals pertaining to different subjects of study; Making files of news-paper cutting etc.
- III. **Lab activities:** Organization of practicals, maintenance of lab attendance registers/log registers, maintenance of glassware and chemicals
- IV. **Activities in the Seminars, workshops and conferences:** Organization of at least one seminar/workshop/conference per academic year either on academic/research aspects and inculcate research spirit among students
- V. **Research activities:** Student study projects (General / RBPT model), Minor or Major research projects, Research guidance to research scholars, Publication of research articles/papers (at least one in 2 years) in UGC-recognized journals,

Registration in Vidwan/Orcid/Scopus/Web of Science

- VI. **Smart Classroom Activities:** Organization of Departmental WhatsApp groups, Edmodo groups/Google Class Rooms/Adobe Spark groups for quick delivery of the subject; Preparation of Moocs content & presentation tube lessons by trained lecturers; Using smart/digital/e- class rooms (mandatory) wherever present; Utilization of YouTube videos (subject to copy rights)etc.

Student-based:

- i. **Class-room activities:** Power point presentations, seminars,assignments
 - ii. **Library activities:** Visit to library during library hour and preparation of notes
 - iii. **Lab activities:** Maintenance of observation note book and record, keeping lab clean and tidy
 - iv. **Activities in the Seminars, workshops and conferences:**
Participation/presentation in seminar/workshop/conference
4. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

OBJECTIVES:

The co-curricular activities are aimed at strengthening the theoretical knowledge with an activity related to the content taught in the class room. The aesthetic development, character building, spiritual growth, physical growth, moral values, creativity of the student.

The different types of co-curricular activities relevant to MEDICAL domain are listed below:

➤ **Academic -based**

- Preparation of Charts/Clay or Thermocol Models
- Debates, Essay Writing Competitions
- Group Discussions
- Departmental magazine
- Formation of Book clubs
- Animal album-making
- Viva-Voce

➤ **Lab/Research –based**

- Digital dissections
- Field Visit/Visiting hospitals and primary health centres and submission of report

- Training at research centers (Hospitals, Diagnostic centres,)
- Exposure to scientific instruments and hands-on experience

➤ **Value -based**

- Organization of first-aid camp, swachha bharat, cleanliness week, girl-child importance, Nutrition and health awareness etc.

➤ **Observation of Days of National/International Importance**

World Cancer Day (February 4 th)	World tobacco day (May 31 st)
National Science Day (Feb 28 th)	World polio day (October 24 th)
National doctors day (march 30 th)	World health day (April 7 th)
World heart day (29 th September)	World kidney day (2 nd Thursday in march)
World diabetes day (14 th November)	World liver day (19 th April)

A Measurable:

- Assignments
- Student seminars (Individual presentation of papers) on topics relating to:
- Quiz Programmes
- Individual Field Studies/projects:
- Group discussion
- Group/Team Projects

B General

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Group Discussions:
- Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
- Any similar activities with imaginative thinking.

5. Recommended Continuous Assessment methods:
Semester End Examinations 75 Marks CIA 25

4.Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: I)	Credits: 4
Paper: 1 VOCATION COMPONENT	ANATOMY	Hrs/Wk: 4

1. Aim and objectives of Course: **ANATOMY**

- To acquire knowledge of the normal structure of human body and its functions.
- Ensure that the students understand the alteration in an anatomical structure and function in disease in the practice of Medical Image Technology

2. Learning outcomes of Course (in consonance with the Bloom's Taxonomy):

By the completion of the course the graduate should be able to –

- Describe the anatomical terms, organization of human body and structure of cell, tissue, membranes and glands.
- Describe the structure and functions of bones and joints.
- Describe the structure and functions of systems in body.

3. Detailed Syllabus: (Five units with each unit having 12 hours of class work)

Unit-1 : Introduction to human anatomy

Basic Anatomical Terminology, planes, body positions, relations, Human Cell Structure, Tissue – definition, types, characteristics, classification, location, functions & formation, Membranes and glands – classification and structure

Musculoskeletal system

Upper Limb: Clavicle, Scapula, Humerus, Radius, Ulna, Hand Muscles, blood supply, nerve supply of upper limb, Lower Limb: Femur, pelvis, Sacrum, Tibia, Fibula, and Vertebral column, Muscles, blood supply, nerve supply of upper limb

Unit-2 : Respiratory System

Thoracic cage anatomy Thoracic cage, ribs, sternum, thoracic vertebrae, Diaphragm, intercostal muscles, muscles of the back, Pleura, Blood supply, nerve supply, lymphatics

Upper respiratory anatomy

Nose, nasopharynx, Oral cavity, oropharynx, Pharynx, larynx, Blood and nerve supply

Lower respiratory anatomy

Trachea to bronchial tree, Lungs with broncho-pulmonary segments and surface anatomy, Bronchial circulation, nerve supply

Unit-3 : Cardiovascular System

Heart and valves, pericardium, endocardium, myocardium, surface anatomy, Major vessels of circulatory system: Aorta, Pulmonary vessels, IV and major branches, Coronary circulation

Unit-4 : Central Nervous System

Organization of the CNS, Central nervous system: Brain and spinal cord Section ,Peripheral nervous system, Autonomic nervous system ,Sympathetic system ,Para sympathetic system, Cerebral circulation ,Circle of Willis, Blood supply of the spinal cord, Pain pathway

Unit-5 Excretory System

Kidney, ureter, bladder, Blood supply and innervation

Abdomen

Liver, pancreas, Islets, Thyroid, parathyroid, adrenals

Recommended Text Books:**Reference books:**

1. Ellen. N .Marieb (2007), Essentials of Human Anatomy and Physiology, Eighth Edition Pearson Education, New Delhi.
2. Arthur C. Guyton & John E. Hall (2006), Text Book of Medical Physiology, Tenth Edition, W.B. Saunders Company, London.

4. Details of Lab/Practical/Experiments/Tutorials syllabus:**Credits :01****Teaching Hours:2hr/w**

1. Study of human skeleton
2. Study of respiratory system with charts and models
3. To identify parts of gastro intestinal system with charts and models
4. Study of central nervous system with charts and models
5. Study of human eye with charts and models
6. Study of human ears with charts and models

5 MODEL QUESTION PAPER (Sem-end. Exam)

BVOC MT	MEDICAL TECHNOLOGY (MT) (Semester: I)	Max. Marks: 75
Paper: 1	ANATOMY	3Hrs

Section -A**I. ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS****5X5=25M**

1. Explain Sectional planes?
2. Explain Bony structures and muscles?
3. Explain Blood vessels?
4. Write a short notes on Esophagus?
5. Write a short notes on Abdominal blood vessels?
6. Explain Neuro Anatomy?
7. Write a short notes on Cerebral hemispheres?
8. Write a short notes on Cranial nerves?

Section -B**II. ANSWER THE FOLLOWING QUESTIONS****5X10=50M**

1. a. Explain in detail about upper thorax?
Or
b. Explain in detail about Divisions of the mid-thorax?
2. a. Explain in detail about Abdomen?
Or
b. Explain in detail about CT/MRI Images of the Thorax?
3. a. Explain in detail about CT/MR Images of Abdomen?
Or
b. Explain in detail about Reproductive Organs?
4. a. Explain about Spine- Vertebra and disc?
Or
b. Explain about Glands and pharynx?
5. a. Explain about Brainstem and associated parts?
Or
b. Explain Digestive and urinary systems?

5. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

A. Measurable:

1. Assignments on:
2. Student seminars (Individual presentation of papers) on topics relating to:
3. Quiz Programmes on:
4. Individual Field Studies/projects:
5. Group discussion on:
6. Group/Team Projects on:

B. General

1. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
2. Group Discussions on:
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
4. Any similar activities with imaginative thinking.

6. Recommended Continuous Assessment methods:

75 Marks semester End Examinations and 25 Marks CIA

4.Details of course-wise Syllabus

B VOC	MT MEDICAL TECHNOLOGY (Semester: I)	Credits: 2
Paper: 2 VOCATION COMPONENT	FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION	Hrs/Wk: 2

1. Aim and objectives of Course: **FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION**

- To provide adequate knowledge in instruments and measuring techniques.

2. **Learning outcomes of Course** (in consonance with the Bloom's Taxonomy):

By the completion of the course the graduate should able to –

- Understand the characteristics and standards of a medical device
- Demonstrate the principle and characteristics of different transducers
- Construct a measuring device for various applications
- Test the signals using analog instruments
- Differentiate various types of display device

3. Detailed Syllabus: (Three units with each unit having 10 hours of class work)

Unit 1 Basic Concept of Medical Instrumentation

Terminology of medicine and medical devices, classifications of biomedical instruments, General measuring system, Static and dynamic characteristics, Signals & Noises, Units & Standards, amplifiers and signal processing.

Transducers – Principle, types, Design of Resistive, Capacitive, Inductive and Piezo-electric transducers.

Unit 2 Measuring Circuits

Bridges, DC Bridges, Design of Wheat-stone Bridge, AC Bridges, Sources & Detectors, Design of AC bridges for measuring inductance & capacitance, Errors & their Compensation, Applications in Biomedical Instruments.

Analog Instruments

Ammeters & Voltmeters, Principle, Operation, Constructional Details of Moving Coil, Moving iron type meters, Wattmeter, Energy meter. Potentiometers, AC & DC Types, Principle of Operation, Application. Analog Multimeter.

Unit 3 Display and Recording Devices

Digital Multimeter, Cathode Ray Oscilloscope – Block diagram, CRT- vertical & horizontal deflection system, LCD, TFT technology, Medical Display Systems, Multichannel Displays, Non-fade Display Systems, photographic recorder, magnetic tape recorder, Inkjet recorder, thermal recorder.

Recommended Text Books:

Reference books:

1. Earnest, O. Doebelin (2002), *Measurement System Application and Design*. McGraw Hill, New York.
2. Albert Helfrick and Cooper, W.D (2007), *Modern Electronic Instrumentation and Measuring Techniques*. Prentice Hall of India.
3. Sawhney, A.K. (2005), *Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai and Sons

4. Details of Lab/Practical/Experiments/Tutorials syllabus:

CREDITS: 01

Teaching Hours: 2hr/w

1. Calibration of Wien's Bridge
2. Calibration of Schering's Bridge
3. Calibration of Maxwell's inductance and Capacitance Bridge
4. Characteristics of DC Vernier potentiometer
5. Measurement using Multimeter & CRO
6. Verify the characteristics of load cell

5 MODEL QUESTION PAPER (Sem-end. Exam)

BVOC MT	MT MEDICAL TECHNOLOGY (Semester: I)	Max. Marks: 50
Paper: 2	FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION	2Hrs

SECTION -A**1. ANSWER ANY FOUR OF THE FOLLOWING****4×5=20**

1. Write about signals and noise?
2. Write the characteristics of static and dynamic?
3. Explain about capacitive?
4. Explain about Ammeters and Voltmeters?
5. Explain about DC Bridges?
6. write the applications in biomedical instruments?
7. Write about applications of AC and DC?

SECTION -B**II.ANSWER THE FOLLOWING QUESTIONS****3×10=30**

- 1 (a) Explain briefly about terminology of medicine and medical
OR
(b) Explain about classifications of bio- medical instruments in detail?
2. (a) Explain different types of transducers
OR
(b) What are inductive and piezo-electric transducers
3. (a) Explain briefly about design of wheat stone bridge
OR
(b) Explain about design of AC bridges for measuring inductance and capacitance
5. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)
 - A. Measurable:
 1. Assignments
 2. Student seminars (Individual presentation of papers) on topics relating to:

3. Quiz Programmes
4. Individual Field Studies/projects:
5. Group discussion
6. Group/Team Projects

B. General

1. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
2. Group Discussions
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
4. Any similar activities with imaginative thinking.

6. Recommended Continuous Assessment methods:

- marks semester End Examinations and 25 Marks CIA

Details of course-wise Syllabus

B VOC MIT	MT MEDICAL IMAGE TECHNOLOGY (Semester: I)	Credits: 4
Paper: 3 VOCATION COMPONENT	PHYSIOLOGY	Hrs/Wk: 4

1. Aim and objectives of Course: **PHYSIOLOGY**

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

- Describe the physiology of cell, tissues, membranes and glands.
- Describe the physiology of blood and functions of heart.
- Demonstrate blood cell count, coagulation, grouping, Hb; BP and Pulse monitoring
- Describe the physiology and mechanism of respiration.
- Demonstrate spirometry
- Describe the physiology of Excretory system

2. Learning outcomes of Course (in consonance with the Bloom's Taxonomy):

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

- The course is designed to assist students to acquire the knowledge of the normal physiology of various human body systems
- To understand the alternation in physiology in disease and practice of critical care technology

3. **Detailed Syllabus:** (Five units with each unit having 12 hours of class work)

Unit-1: The Cell

Cell structure and functions of the various organelles, Endocytosis and exocytosis

Acid base balance and disturbances of acid base balances (alkalosis, acidosis)

Cardiovascular system

- Physiology of heart
- Heart sounds, auscultatory areas
- Cardiac cycle, cardiac output and factors affecting cardiac output, stroke volume, contractility, preload, after load
- O₂ delivery, uptake to tissues
- Cardiac conduction system, Regulation of rate, basic arrhythmias
- Arterial pressure, Blood pressure, Hypertension, hypotension

Blood pressure

- Maintenance of normal BP and factors affecting it
- Systolic, diastolic, pulse pressure, mean arterial pressure

Electrocardiogram

- Principles of ECG, Normal ECG

Unit-2: Blood

- Homeostasis
- Composition of blood, functions of blood and plasma proteins, classification of protein.
- Pathological and Physiological variation of the RBC, WBC's, platelets
- Functions of haemoglobin
- Erythrocyte sedimentation rate
- Detailed description about WBC, TC, DC & functions
- Platelets: Formation, normal level and functions
- Blood group and Rh factor

Unit-3: Respiratory system

- Physiology of breathing
- Regulation of breathing
- Respiratory movements
- Mechanics of breathing, muscle action
- Pressure, volume
- Resistance, compliance
- Definition and normal values of lung volumes and lung capacities, Lung volumes & capacity

Gas exchange & transport – oxygen, CO₂

- Diffusion, Gas exchange, mechanism of diffusion
- O₂ transport & abnormalities, Factors affecting O₂ transport

- CO₂ transport & abnormalities
- Work of breathing, pulmonary function tests
- Acid base balance, ABG

Unit-4 Central Nervous system

- Function of CSF, Intracranial pressure
- Metabolic requirements of the brain, Cerebral autoregulation
- Consciousness
- Basic function of the eyes: light reflex, movements
- Cough and gag reflex

Digestive system

- Physiological and anatomy of the GIT
- Food digestion in the mouth, stomach and intestine
- Absorption of foods
- Role of bile in the digestion

Unit-5: Excretory system

- Normal urinary output, Micturition
- Renal function tests, Renal disorders

Endocrine system

- Function of pituitary
- Thyroid
- Parathyroid , Hormones
- Adrenal / Pancreatic

Reproductive system

- Formation of semen & spermatogenesis
- Brief account of menstrual cycle

Recommended Text Books:

Reference books:

1. Cohen, Memmler: Structure & Function of Human Body, Lippincott Williams & Wilkins; Tenth edition (2012).
2. Waugh: Ross & Wilson Anatomy & Physiology in health and illness Penguin Books Ltd (2010).
3. Tortora: Anatomy & Physiology, John Wiley & Sons (2012).
4. Venkatesh D: Basics of Medical Physiology for Nursing, LWW (2009).
5. Hall J: Guyton Textbook of Medical Physiology. Elsevier (2012).
6. Tandon: Best & Taylor's Physiologic Basis of Medical Practice (2011).

4. Details of Lab/Practical/Experiments/Tutorials syllabus:**CREDITS: 01**
Teaching Hours:2hr/w

1. Blood Testing- Grouping
2. Blood Cell Count WBC/RBC
3. Urine Testing
4. Blood Sugar Testing
5. Hb Testing
6. BP APPARTAUS – MEASURING THE BP
7. ECG—Principles

(Students may be trained in the nearby Medical Labs for the Hands on Experience)

MODEL QUESTION PAPER (Sem – end Exam)

BVOC MIT	MT MEDICAL TECHNOLOGY (Semester: I)	Max. Marks: 75
Paper: 3	PHYSIOLOGY	3Hrs

SECTION -A**I. ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS****5X5=25M**

1. Explain Cell Structure?
2. Explain Physiology of heart?
3. Explain Blood pressure?
4. Write short notes on Homeostasis?
5. Explain Physiology of breathing?
6. What is meant by Diffusion?
7. What are the Function of CSF?
8. What are the Function of pituitary?

SECTION -B**II. ANSWER THE FOLLOWING QUESTIONS****5×10=50**

1. a. Explain in detail about Electrocardiogram?
Or
b. Explain about Cardiac conduction system?
2. a. Explain about Functions of haemoglobin?
Or
b. Write detailed description about WBC, TC, DC & functions?
3. a. Explain Respiratory movements?
Or
b. Explain about CO₂ transport & abnormalities?

- 4 a. Explain Metabolic requirements of the brain?
Or
b. Explain Food digestion in the mouth, stomach and intestine?
 - 5 a. Explain Brief account of menstrual cycle?
Or
b. Explain Excretory system?
5. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)
- A. Measurable:
- a. Assignments :
 - b. Student seminars (Individual presentation of papers) on topics relating to:
 - c. Quiz Programmes :
 - d. Individual Field Studies/projects:
 - e. Group discussion :
 - f. Group/Team Projects
- B. General
- a. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
 - b. Group Discussions:
 - c. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
 - d. Any similar activities with imaginative thinking.
6. Recommended Continuous Assessment methods:
75 Marks semester End Examinations and 25 Marks CIA

**BACHELOR OF VOCATION
MEDICAL TECHNOLOGY (MT)
COURSE STRUCTURE AND SYLLABUS: W.E. F 2020-21 Admitted batch
1st year -Semester II**

Course No.	Course Name	Mid semester	Semester final	Total marks	Teaching Hours/ Week	Credits
1	***English	25	75	100	4	3
2	***Language(h/t/s)	25	75	100	4	3
3	***Life skill course	0	50	50	2	2
4	***Skill development courses	0	50	50	2	2
M-1	***Organic and general chemistry	25	75	100	4	4
	***Practical – ii volumetric analysis	0	50	50	2	1
M-2	Basic electrical and electronics	25	75	100	4	4
	Lab/ practical: basic electrical and electronics	0	50	50	2	1
Core-1	Positioning in radiology	25	75	100	4	4
	Lab/practical : positioning in radiology	0	50	50	2	1
Core-2	Radiological physics and dark room techniques	0	50	50	2	2
	OJT	0	50	50	2	1
	TOTAL			850	34	28

*** As per CBCS-2021 syllabus

1 Program objectives, outcomes, co-curricular and assessment methods

BACHELOR OF VOCATION

MEDICAL TECHNOLOGY

1. Aim and objectives of UG program in Subject: Critical care Management

After the Completion of this programme student shall acquire the:

- Ability to ensure that medical equipment is well maintained and safely functional.
- Follow safety codes and standards, troubleshoot faulty devices and achieve appropriate skills for employment.
- Ability to Operate equipment in ICU & Emergency wards

2. Learning outcomes of Subject (in consonance with the Bloom's Taxonomy):

The Learning Outcomes of the programme could be in consonance with the various equipments in ICU, which includes –

- Remember (Lowerorder)
 - Understand (LowerOrder)
 - Apply (LowerOrder)
 - Analyze (HigherOrder)
 - Evaluate& Problem Solving (HigherOrder)
 - Create new Technologies (HigherOrder)
- **Critical thinking:** Able to understand and utilize the principles of scientific enquiry, think analytically, clearly and evaluate critically while solving problems and making decisions during various emergencies situations and machinery problems.
 - **Effective communication:** Able to formally communicate Scientific ideas and practical diagnosis of various emergency cases to others using both oral and written communication skills.
 - **Social interaction:** Able to develop individual behaviour and influence society and social structure.
 - **Effective citizenship:** Able to work with a sense of responsibility towards social awareness and follow the ethical standards in the society.
 - **Ethics:** Ability to demonstrate and discuss ethical conduct in scientific activities.
 - **Self-directed and life-long learning:** Able to recognize the need of life-long learning and engage in research and self-education.

GENERAL CURRICULAR ACTIVITIES

Lecturer-based:

- I. **Class-room activities:** Organization of Group discussions, question-answer sessions, scientific observations, use of audio-visual aids, guidance programmes, examination and evaluation work (scheduled and surprise tests), quizzes, preparation of question banks, student study material, material for PG entrance examination etc.
- II. **Library activities:** Reading books and magazines taking notes from prescribed and reference books and preparation of notes on lessons as per the syllabus; Reading journals and periodicals pertaining to different subjects of study; Making files of news-paper cutting etc.
- III. **Lab activities:** Organization of practicals, maintenance of lab attendance registers/log registers, maintenance of glassware and chemicals
- IV. **Activities in the Seminars, workshops and conferences:** Organization of at least one seminar/workshop/conference per academic year either on academic/research aspects and inculcate research spirit among students
- V. **Research activities:** Student study projects (General / RBPT model), Minor or Major research projects, Research guidance to research scholars, Publication of research articles/papers (at least one in 2 years) in UGC-recognized journals, Registration in Vidwan /Orcid /Scopus/Web of Science
- VI. **Smart Classroom Activities:** Organization of Departmental WhatsApp groups, Edmodo groups/Google Class Rooms/Adobe Spark groups for quick delivery of the subject; Preparation of Moocs content & presentation tube lessons by trained lecturers; Using smart/digital/e- class rooms (mandatory) wherever present; Utilization of YouTube videos (subject to copy rights) etc.

Student-based:

- **Class-room activities:** Power point presentations, seminars, assignments
 - **Library activities:** Visit to library during library hour and preparation of notes
 - **Lab activities:** Maintenance of observation note book and record, keeping lab clean and tidy
 - **Activities in the Seminars, workshops and conferences:**
Participation/presentation in seminar/workshop/conference
3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work

4. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

The co-curricular activities are aimed at strengthening the theoretical knowledge with an activity related to the content taught in the class room. The aesthetic development, character building, spiritual growth, physical growth, moral values, creativity of the student.

The different types of co-curricular activities relevant to MEDICAL domain are listed below:

- Academic -based
 - Preparation of Charts/Clay or Thermocol Models
 - Debates, Essay Writing Competitions
 - Group Discussions
 - Departmental magazine
 - Formation of Book clubs
 - Viva-Voce
- Lab/Research –based
 - Digital dissections
 - Field Visit/Visiting hospitals and primary health centres and submission of report
 - Training at research centers (Hospitals, Diagnostic centres,)
 - Exposure to scientific instruments and hands-on experience
- Value -based
 - Organization of first-aid camp, swachha bharat, cleanliness week, girl-child importance, Nutrition and health awareness etc.

World Cancer Day (February 4 th)	World tobacco day (May 31 st)
National Science Day (Feb 28 th)	World polio day (October 24 th)
National doctors day(march 30 th)	World health day(April 7 th)
World heart day(29 th September)	World kidney day(2 nd Thursday in march)
World diabetes day(14 th November)	World liver day(19 th April)

A) General

- Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
- Group Discussions
- Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
- Any similar activities with imaginative thinking.

5. Recommended Continuous Assessment methods:

75 Marks semester End Examinations and 25 Marks CIA

Required instruments/software/ computers for the course (Lab/Practical course-wise required i.e., for a batch of 15 students)

Sem. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1	Basic electrical and electronics	Ziener diode kit	Cressall	3
		Half wave rectifier kit& full wave rectifier kit	Yash enterprises.	3 EACH
		Cro	J &s enterprises	1
		Ammeter	Hi tech electrical engineers	10
		Voltmeter	Syska wires	10
		Dc voltmeter	Arduino starter kits	2
		Rheostat	Crown electronic system	2
		Resister-470 Ω ,1k Ω ,10k Ω ,33k Ω	Klein tools	20 EACH
		Capacitor-0.47 μ f	Robin teper	20 EACH
		Rc phase shift oscillator	Klein tools	2
		Multiometer	Hi tech electrical engineers	1
		Survey meter	Daksh quality systems	1
		Tissue equivalent	Strarradiance	1

2.	Positioning in radiology	phantom	medical devices	
		Catphan	Mex india	1
		Al filter	Daksh quality systems	1
		Beam alignment test tool	Apt medical systems private limited	1

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Credits: 4
Paper: 2 VOCATION COMPONENT	BASIC ELECTRICAL AND ELECTRONICS	Hrs/Wk: 4

1. Aim and objectives of Course: BASIC ELECTRICAL AND ELECTRONICS

- To provide adequate knowledge on the analysis of electric & electronic circuits

2. Detailed Syllabus: (Five units with each unit having 12 hours of class work)

Unit I

DC and AC Circuits

Basic electrical quantities, definition and units, Electric field & magnetic field, Ohm's law, Kirchoff's laws, series and parallel circuits, Single phase circuits, three phase circuits.

Unit II Magnetic Circuits and Transformers

Basic concepts of Magnetic circuit, Faraday's laws of electromagnetic induction, Transformer and its construction, principle of operation. Special Electrical Machines – DC Generators, DC Motors, Single phase induction Motor

Unit III Semi conductor devices and its application

Overview of diode and transistors, various configurations and characteristics, principle of operation of Zener diode. Half wave, full wave, bridge rectifier circuits, filters, voltage regulator, principles of regulated power supply. Clipping and clamping operations using diodes. LDR, LED, 7 segment Display, LCD, Laser diode, Opto coupler, photo transistor.

Unit IV Analog Electronics

Introduction to amplifiers, types - cascaded amplifier, differential amplifier, darlington pair, push pull amplifier. Oscillator circuits – Sinusoidal, phase shift, LC oscillators, Hartley, Colpitts, principle and applications. High pass and low pass RC circuits, operational amplifier basics and applications.

Unit V Digital Electronics

Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion

Reference books:

1. Mehta, V.K. (2010), *Principles of Electrical and Electronics*, Eleventh Edition, S.Chand publisher, New Delhi
2. Salivahanan.S (2010), *Electronic devices and circuits*, Tata McGraw Hill publishing Company Ltd.
3. Murugesh Kumar, K., & Jagannathan,V (2007), *Basic Electrical, Electronics, Computer and Communication Engineering*, Second Edition, Vikas Publishing House Pvt. Ltd., Ahmedabad.

3 Details of Lab/Practical/Experiments/Tutorials syllabus: **CREDITS: 01** **Teaching Hours:2hr/w**

1. Verification of Ohm's law, Kirchoff's law.
2. Measurement of power using Ammeter, Volt meter, Watt meter
3. Load test on Single Phase Transformer.
4. Diode and Zener diode Characteristics.
5. Half wave Rectifier and Full wave Rectifier
6. Transistor characteristics for common emitter configuration.
7. RC phase shift oscillator

4 MODEL QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Max. Marks: 75
Paper: 2 VOCATION COMPONENT	BASIC ELECTRICAL AND ELECTRONICS	3Hrs

ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS **5X5=25M**

1. Write a short on series and parallel circuit?
2. Write a short on single phase induction motors?
3. Write a short one high pass and low pass RC circuits?
4. Write a short on 7 segment display?
5. Explain about flipflops? write a short on RS flipflops
6. Write a short on photo transistors?
7. Write a short on A/D and D/A conversions?
8. Write a short notes on logic gates?

II. ANSWER THE FOLLOWING QUESTIONS**5X10=50M**

1A. Explain about the faraday's law of electromagnetic inductions?

OR

B. Explain about the ohm's law?

2A. Explain about the kirchoff's law?

OR

B. Explain about the DC GENERATOR?

3A. Explain about the Half adder and full adder and its truth tables?

OR

B. Explain about the push pull amplifier and Darlington pair circuits?

4A. Explain about different types of Oscillator circuits?

OR

B. Explain the principals and operations of zener diode?

5A. Explain briefly about half and full adders?

OR

B. Explain about different types of amplifiers?

5. LAB MODEL QUESTION PAPER

B VOC MT	MEDICAL TECHNOLOGY (Semester: II)	Max. Marks: 50
M-2 PAPER VOCATION COMPONENT	BASIC ELECTRICAL AND ELECTRONICS	3Hrs

1. Verify the Ohm's law?
2. Verify the Kirchoff's law?
3. Explain the characteristics of Transistor for common emitter configuration?
4. How to Measure the power using Ammeter, Volt meter, Watt meter?
5. verify the Characteristics of Diode and Zener diode ?
6. verify the Load test on Single Phase Transformer?
7. Verify Half wave Rectifier ?
8. Verify Full wave Rectifier ?
9. Verify RC phase shift oscillator ?

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Credits: 4
Paper: 3 VOCATION COMPONENT	POSITIONING IN RADIOGRAPHY	Hrs/Wk: 4

1. Aim and objectives of Course: POSITIONING IN RADIOGRAPHY

- Students will acquire knowledge on pathological conditions-injuries, fractures and dislocations congenital
- Students has to know about positioning of Radiography on various parts of the body.

2. Detailed Syllabus: (Five units with each unit having 12 hours of class work)**Unit-1 Positioning Radiography – I****Skeletal System****Upper Limb**

Techniques for hand-fingers-thumb-wrist joint-forearm-elbow joint-humerusshoulderjoint and sterno-clavicular joint.

Lower Limb

Techniques for foot-calcaneum-ankle joint-leg-knee joint-patella-and femur(lower two thirds)

Unit-2**Pelvic Girdle**

Techniques for pelvic-iliac fossa-ischium-and sacro iliac joint.

Vertebral Column

Techniques for Atlanto-occipital articulation, cervical vertebrae, cervicothoracic junction, thoracic vertebrae, lumbar vertebrae, lumbosacral articulation, sacrum

Unit-3**Coccyx****Bones of Thorax**

Techniques for sternum, ribs (upper and lower).

Skull

Techniques for cranium, facial bones, sellaturcica, temporal Bone, martoidsand optic foraminae, sinuses, mandible and temporo mandible joint.

Unit-4**Chest**

Chest X-Ray, PA, AP lateral, decubitus etc.

Abdomen

Routine and radiographs in acute condition Bedside radiography –techniques for acute chest conditions-intestinal obstruction, abdominal perforations-vertebral injuries-skull injuries-fractures immobilized.Theatre radiography-introduction to C-arm image intensifier- exposure &training.

Unit-5**Soft tissue radiography**

Neck, abdomen, skull, mammogram

References:

1. A guide to Radiological Procedures - 2nd edition, Stephan Chapman & Richard Nakielny, 1986.
2. Clark's Positioning in Radiography.
3. Merrill's atlas of radiographic positioning and radiologic procedures, 1,2& 3 Volumes.
4. Diagnostic radiography: A concise practical manual, Glenda J. Bryan, Churchill Livingstone, 1987.
5. Handbook of Medical Radiography - C. Ram Mohan
6. Radiological Procedures (A guideline) – Bhushan N. Lakkar

3. Details of Lab/Practical/Experiments/Tutorials syllabus: CREDITS: 01
Teaching Hours:2hr/w

1. X-ray beam alignment test
2. Determination of magnification by changing Source to Image Distance
3. Determination of magnification by changing Object to Image Distance
4. Radiation Protection Survey
5. Leakage radiation test
6. Positioning Radiography

4.MODEL QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Max. Marks: 75
Paper: 3 VOCATION COMPONENT	POSITIONING IN RADIOGRAPHY	3Hrs

I.ANSWER ANY FIVE OF THE FOLLOWING QUESTIONS**5X5=25M**

1. Write a short notes on sterno-clavicular joint?
2. Write a short notes on humerusshoulder?
3. Explain sacro iliac joint?
4. Explain cervical vertebrae?
5. Write a short notes on facial bones?
6. Write a short notes on temporo mandible joint?
7. Explain decubitus?
8. Explain Bedside radiography?

II.ANSWER THE FOLLOWING QUESTIONS**5X10=50M**

1. a. Explain in detail about upper limb?
Or
- b. Explain indetail about Lower Limb?

- 2.a.Explain about Pelvic Girdle?
Or
b.Explain in detail about Vertebral Column?
- 3.a.Explain about ribs (upper and lower)?
Or
b.Explain in detail about Skull?
- 4.a.Explain about Chest X-Ray?
Or
b.Explain about PA, AP lateral?
- 5.a.Explain about Soft tissue radiography Neck?
Or
b.Explain about Mammogram?

5.LAB MODEL QUESTION PAPER

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Max. Marks: 50
Paper: 3 VOCATION COMPONENT	POSITIONING IN RADIOGRAPHY	3Hrs

1. Test the alignment of X-ray beam ?
2. Determine the magnification by changing Source to Image Distance?
3. Determine the magnification by changing Object to Image Distance?
4. How to test the Leakage radiation ?
5. verify the Positioning of Radiography?

Details of course-wise Syllabus

B VOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Credits: 2
C-2 PAPER VOCATION COMPONENT	RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES	Hrs/Wk: 2

1. Aim and objectives of Course: **RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES**

- To acquire knowledge of the Radiation projection and about the study of x-rays.
- Students will acquire the knowledge of various dark room techniques like diagnosing image quality, X-room design.

2. **Detailed Syllabus:** (Three units with each unit having 10 hours of class work)

Unit-1 :X-rays – Generation and Properties

Electromagnetic radiation, spectrum and general properties: Wave and quanta concept, Processes of x-ray generation: General and characteristic radiation, X-ray spectrum, factors influencing the intensity of x-rays.

X-rays – Interaction

Basic interactions between diagnostic x-rays and matter: Coherent scattering, photo electric effect and Compton Effect – probability of occurrence and its applications in radiology. Biological effects of radiation. Attenuation: Linear and mass attenuation coefficients, Half Value Layer, Factors affecting attenuation, practical aspects of these phenomenon in Radiology, scatter radiation.

Unit-2: RadiationMeasurements:

Radiation quantities and units, Radiation measuring instruments: Gas filled detectors: ionization chamber, proportional counter, Geiger-Muller counter, scintillation counter, solid state detector, Personal monitoring devices: Film, Thermo luminescent and Pocket dosimeters.

Radiation Protection

Aim of radiation protection, concept of As Low As Reasonably Achievable, International Commission on Radiation Protection (ICRP) and Atomic Energy Regulatory Board (AERB) recommendations, maximum permissible dose, Principles of protection in X-ray department for patient, personnel and public, Time-Distance-Shielding, protective devices, X-ray room design.

Unit-3: Radiographic photography:

X-ray films, Screen – film cassette, Characteristic curve, Radiographic Image Quality, Automatic Film Processor, Laser camera: Wet and Dry, Computed Radiography & Digital Radiography.

Construction of dark room, dry bench, wet bench, processing of film, developer, fixer, hangers, safelight

References:

1. Christensen's Physics of Diagnostic Radiology – 4th edition, Thomas S. Curry, 1990.
2. Chesney & Chesney's X-ray Equipments for Student Radiographers, 1987.
3. Chesney's Radiographic Imaging – 4th edition, Wiley-Blackwell, 1994
4. Radiologic Science for Technologists- 9th edition, Stewart Carlyle Bushong, Mosby Elsevier, 2008.
5. Principles of Imaging Science & Protection, Michael A. Thompson, W.B. Saunders Company, 1994.
6. Radiographic Imaging & Exposure, Terri L.Fauber, Mosby Elsevier, 2009.

3. MODEL QUESTION PAPER

BVOC MT	MT MEDICAL TECHNOLOGY (Semester: II)	Max. Marks: 50
Paper: 1	RADIOLOGICAL PHYSICS AND DARK ROOM TECHNIQUES	2Hrs

I. ANSWER ANY FOUR OF THE FOLLOWING QUESTIONS**4X5=20M**

1. Explain Patient Transfer Technique?
2. Explain General Abdominal Preparation for patient?
3. Explain Aseptic Procedures?
4. Explain Drugs Used In Resuscitation?
5. Write a short notes on Infection Sources?
6. Write a short notes on Transmission Modes?
7. Explain Physiological Considerations?

II. ANSWER THE FOLLOWING QUESTIONS**3X10=30M**

1. a. Explain about Restraint Techniques?
Or
b. Explain General Comfort And Reassurance For The Patient?
2. a. Explain Nursing Procedures In Radiology?
Or
b. Explain various Methods Of Sterilization?
3. a. Explain about Poisons And Dangerous Drugs?
Or
b. Write in detail about Drugs Used In Preparation Of The Patient?