

BHAIKAKA UNIVERSITY

Rules/Regulations & Syllabus

For the course of

B.Sc.- Medical Technology
[Imaging Technology]

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BHAIKAKA UNIVERSITY

F.Y.B.Sc.- Medical Technology
[Imaging Technology]
Revision in the Curriculum

Sr. No.	Subject	Course No.	Teaching Hours
Main Subjects			
1	Human Anatomy	BMT-101	60
	Practical – Anatomy	BMT-101(P)	30
2	Human Physiology	BMT-102	60
	Practical – Physiology	BMT-102(P)	30
3	Pathology	BMT-103	60
	Practical-Pathology	BMT-103(P)	30
4	Microbiology	BMT-104	60
	Practical- Microbiology	BMT-104(P)	30
5	Biochemistry	BMT-105	60
	Practical- Biochemistry	BMT-105(P)	30
Main Subjects- Teaching hours			450
Subsidiary subjects			
6	English	E-101	60
	Practical-English	E-102(P)	30
7	Health-Care	BMT-S-101	30
Subsidiary subjects- Teaching hours			120
Teaching hours-Theory/Practicals			570
Hospital Posting			360
Total Teaching hours			930

BHAIKAKA UNIVERSITY

B.Sc.- Medical Technology (First Year)

Table 1. Subjects, Credits and Scheme of Examination

Sr. No.	Subject	Course No.	No. Credits per week	Duration of Uni. Exam	External Marks	Internal Marks	Total	Grand Total
1	Human Anatomy	BMT-101	2	3	80	20	100	100
	Practical – Anatomy	BMT-101(P)	1	-	-	-	-	
2	Human Physiology	BMT-102	2	3	80	20	100	100
	Practical – Physiology	BMT-102(P)	1	-	-	-	-	
3	Pathology	BMT-103	2	3	80	20	100	100
	Practical-Pathology	BMT-103(P)	1	-	-	-	-	
4	Microbiology	BMT-104	2	3	80	20	100	100
	Practical- Microbiology	BMT-104(P)	1	-	-	-	-	
5	Biochemistry	BMT-105	2	3	80	20	100	100
	Practical- Biochemistry	BMT-105(P)	1	-	-	-	-	
6	English	E-101	2	3	80	20	100	100
	Practical-English	E-102(P)	1	-	-	-	-	
7	Health-Care	BMT-S-101	1	2	40	10	50	50
							Total	650

Rules & Regulations for the course of F.Y.B.Sc.- Medical Technology

B.Sc.- Medical Technology (First Year)

With the increasing use of advanced diagnostic and therapeutic technologies in medicine; there has been a challenging career for well-trained Medical technologists in different specialties of **Medical Technology**.

Proposed course of First Year of **B.Sc. – Medical Technology** offers a sound foundation to pursue further, in second and third year of B.Sc. MT, any of the several specialties of Medical; Technology; some of them have been mentioned here-under:

- a. Clinical Laboratory Technology
- b. Operation Theater & Anesthesia Technology
- c. Respiratory Care Technology
- d. Imaging Technology
- e. Cardiac Care Technology
- f. Perfusion Technology
- g. Neuro Science Technology
- h. Renal Dialysis Technology
- i. Radiotherapy Technology

R. BMT. 1: Eligibility for the admission:

Candidates who have passed 10+2 examination conducted by any recognized School Certification Board or Equivalent Examination; with principal subjects Physics, Chemistry, Biology/Maths and English (A or B or AB group student).

R. BMT. 2: Duration of the course:

Duration shall be for a period of **three years** for the course of B.Sc.- Medical Technology in *Clinical Laboratory Technology*.

All other courses will be of **four years** duration; having a compulsory stipendiary Internship during the fourth year.

R. BMT. 3: Medium of instruction:

The medium of instruction and examination shall be in English.

R. BMT. 4: Attendance

Candidate shall be required to attend at least 75% of the Lectures and Practical separately in each year.

R. BMT. 5:

Subjects, Credits and Scheme of examination

Main and Subsidiary subjects are common in first year for all the courses of Medical Technology. The subject-wise details of examination for the first year have been given in Table 1.

There shall be three examinations one each at the end of 1st, 2nd and 3rd year.

There shall be no University Practical Exam in the First Year.

It is however necessary that candidates score at least 35% internal marks in all main as well as subsidiary subjects - theory and practical - to become eligible to appear in the University examination.

R. BMT. 6:

Eligible candidate desirous for appearing in the University examination of any/all theory papers must forward his/her application in the prescribed form from the respective college to the University on or before the date prescribed for the purpose under the relevant ordinance.

R. BMT.7:

Standard of passing:

The standard of passing the F.Y.B.Sc. degree examination will be as under:

- (a) To pass the B.Sc. Degree examination, a candidate must obtain at least **35% marks** (aggregate of external and internal) in each of the main and subsidiary subjects **separately**.
- (b) Award of class will be as per the Bhaikaka University.

R. BMT. 8:

Promotion and A.T.K.T.

- a. Candidates, who have passed separately in theory and practical of all subject heads (course) in F.Y.B.Sc. and S.Y.B.Sc. Shall be promoted to S.Y.B.Sc. And T.Y.B.Sc. Respectively.
- b. Candidates, who fail in **any three** of the subject heads (courses) in F.Y.B.Sc. Or S.Y.B.Sc. Shall be granted A.T.K.T. And shall be allowed to attend S.Y.B.Sc. Or T.Y.B.Sc.; as the case may be. Candidate can re-appear in the following subject-heads in the subsequent exam.
- c. Candidate would however not be allowed for the promotion from S.Y.B.Sc. to T.Y.B.Sc. unless and until s/he passes all subjects of F.Y.B.Sc.

SYLLABUS FOR F.Y.B.Sc. – Medical Technology

Course code: BMT 101

HUMAN ANATOMY

Theory classes: 60 hours, Practical classes : 30 hours

Unit 1. Introduction: human body as a whole

Theory:

- Definition of anatomy and its divisions
- Terms of location, positions and planes
- Cell and its organelles
- Epithelium-definition, classification, describe with examples, function
- Glands- classification, describe serous & mucous glands with examples
- Basic tissues – classification with examples

Practical:

- Histology of types of epithelium
- Histology of serous, mucous & mixed salivary gland

Unit 2. Locomotion and support

Theory:

- Cartilage – types with example
- Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull
- Joints – Classification of joints with examples, synovial joint (in detail for radiology)
- Muscular system: Classification of muscular tissue
- Names of muscles of the body

Practical:

- Demo of all bones showing parts, radiographs of normal bones & joints
- Demonstration of muscles of the body (as functional groups)

Unit 3. Cardiovascular system

Theory:

- Heart-size, location, chambers, exterior & interior
- Blood supply of heart
- Systemic & pulmonary circulation
- Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery
- Inferior venacava, portal vein, portosystemic anastomosis
- Great saphenous vein
- Lymphatic system- cisterna chyli & thoracic duct
- Names of regional lymphatics, axillary and inguinal lymph nodes in brief

Practical:

- Demonstration of heart and vessels in the body
- Normal chest radiograph showing heart shadows

Unit 4. Gastro-intestinal system

Theory:

- Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring)
- Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas
- Radiographs of abdomen

Unit 5. Respiratory system

Theory:

- Parts of RS, nose, nasal cavity, larynx, trachea, lungs,
- Names of paranasal air sinuses

Practical:

- Demonstration of parts of respiratory system.
- Normal radiographs of chest

Unit 6. Urinary system

Theory:

- Kidney, ureter, urinary bladder, male and female urethra

Practical:

- ◆ Demonstration of parts of urinary system
- ◆ Radiographs of abdomen-IVP, retrograde cystogram

Unit 7. Reproductive system

Theory:

- Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross)
- Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology)
- Mammary gland – gross

Practical:

- Demonstration of section of male and female pelvis with organs *in situ*
- Radiographs of pelvis – hysterosalpingogram

Unit 8. Endocrine glands

Theory:

- Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal gland – (gross)

Practical:

- Demonstration of the glands

Unit 9. Nervous system

Theory:

- Neuron
- Classification of NS
- Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (Gross Anatomy)
- Meninges, Ventricles & cerebrospinal fluid
- Blood supply of brain (In Brief)
- Cranial nerves (Only Names)

Practical:

- Demonstration of all part of brain

Unit 10. Sensory organs:

Theory:

- Skin: Skin-histology
- Appendages of skin
- Eye: Parts of eye & lacrimal apparatus
- Extra-ocular muscles & nerve supply
- Ear: parts of ear- external, middle and inner ear and contents

Practical:

- Demonstration and histology of eyeball

Unit 11. Embryology:

Theory:

- Spermatogenesis & oogenesis
- Ovulation, fertilization
- Placenta

There shall be no University Practical Examination.

REFERENCE BOOKS

- 1 William Davis (P) understanding Human, Anatomy and Physiology MC Graw Hill
2. Human Anatomy for Nursing & Allied Sciences - 1st edition, Dr. M.K. Anand, Dr. Meena Verma, The Arora Medical Publishers Pvt.Ltd
3. Fattana, Human anatomy, (Description and applied), Saunder's & C P Prism Publishers, Bangalore – 1991
4. ESTER . M. Grishcimer, Physiology & Anatomy with Practical, Considerations, J.P. Lippin Cott. Philadelphia

Course code: BMT 102

HUMAN PHYSIOLOGY

Theory classes: 60 hours, Practical classes : 30 hours

Theory:

Unit 1. Blood and Muscle Physiology:

2. Composition & Function of Blood
3. Erythropoiesis and Blood group
4. Hemostasis
5. Neuromuscular junction

Unit 2. Digestive System and Excretory System

- Movement and Alimentary tract
- Deglutition and Mechanism of Vomiting, Diarrhea
- Digestive juices
- Micturition
- Function of Kidney

- Regulation of acid-base balance

Unit 3. Cardiovascular and Respiratory System

- Heart rate and sound
- Blood pressure
- Mechanism of breathing
- Oxygen and Carbon dioxide Transport
- Pulmonary volume and capacity

Unit 4. Endocrinology and Reproductive System

- (c) Contraceptives Measures and Menstrual cycle
- (d) Puberty
- (e) Pregnancy and Lactation
- (f) Hormones of Pituitary, Thyroid & Parathyroid Glands
- (g) Hormones of Adrenal Gland and Pancreas

Unit 5. Nervous System and Special Senses

- Neuron and Neuroglia
- Properties of nerve fibre
- Reflex mechanism and Receptors
- Mechanism of vision and hearing
- Taste and smell

Practical:

- Arterial Blood Pressure
- Pulse
- Heart rate
- Breathing rate

There shall be no University Practical Examination.

REFERENCE BOOKS

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers
2. Ganong (William F) Review of Medical Physiology. Latest Ed . Appleton
3. Jain AK, Concise Physiology, Latest Ed.

Course code: BMT 103

PATHOLOGY

Theory classes: 60 hours, Practicals: 45 hours

PATHOLOGY

Unit 1. Histo Pathology

- Introduction to Histo Pathology
- Receiving of Specimen in the laboratory
- Use & care of Microscope
- Various Fixatives, Mode of action, Preparation and Indication.
- Tissue processing for routine paraffin sections
- Section Cutting
- Staining of tissues - H& E Staining
- Bio-Medical waste management

Unit 2. Clinical Pathology

- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical Specimens
- Urine Examination – Collection and Preservation of urine.
- Physical, chemical, Microscopic Examination

Unit 3. Haematology

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV, ESR

Unit 4. Blood Bank

- Introduction
- Blood grouping and Rh Types

Practical: Pathology

Pathology

- Blood Grouping Rh typing.
- Hb Estimation, Packed Cell Volume[PCV], Erythrocyte Sedimentation rate{ESR}
- Bleeding Time, Clotting Time.
- Histopathology – Section cutting and H &E Staining.[For BSc MLT only]

- ◆ Bancroft : Theory and Practical of Histology techniques
- ◆ Textbook of Clinical Blood Banking Science by Zmijewski.
- ◆ Manual for Clinical Pathology by Sabitry Sanyal
- ◆ Practical Pathology by Dr.P.Chakraborty & Gargi Chakraborty
- ◆ Haematology for students and practitioners by Ramnik Sood
- ◆ Histological techniques by K.Laxminarayan
- ◆ Practical Pathology by Dr.K.Uma Chaturvedi & Tejsindersingh

Course code: BMT 104

MICROBIOLOGY

Theory classes: 60 hours, Practicals: 45 hours

Unit-1 Historical development & microbiology

- History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates). Nobel prize awarded for research in Microbiology
- Development in medical microbiology & immunology

Unit-2 Microscopy

- Microscopy: instruments, Types of microscopic techniques
- Details of Light Microscope (Principles, Techniques & Applications)
- Principle & Application of following microscope:

Dark Field Microscopy, Phase contrast microscopy, Fluorescent Microscopy, Confocal microscopy & Electron Microscopy

Unit-3 Morphology & classification

- Nomenclature and classification of microbes (in brief)
- Size & Shape
- Morphology of bacteria: Structures of a bacterial cell and their functions
- Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements

Unit-4 Immunology

- Immunity (in brief)
- Infection: Sources of infection, Modes of transmission, Factors predisposing to microbial Pathogenicity, Types of infectious diseases
- Types of Vaccine & Immunization schedule

Unit-5 Sterilisation and Disinfection

- Sterilisation and Disinfection (in detail)
- Principles and use of equipments of sterilization (Namely Hot Air Oven, Autoclave, Inspissator & Pasteurization)
- Anti septic and disinfectants

Unit-6 General microbiology

- Culture media in diagnostic bacteriology.
- Culture methods
- Identification of bacteria-biochemical tests
- Antimicrobial sensitivity test

Unit 7. Hospital infection

- Causative agents, transmission methods,
- Prevention and control Hospital infection.
- Blood Born Infections

Principles and practice Biomedical waste management

Practical: Microbiology

1. Compound Microscope.
2. Grams stain
3. Acid Fast staining
4. Demonstration and sterilization of equipments – Hot Air oven, Autoclave, Bacterial filters.
5. Demonstration of commonly used culture media, culture methods:
Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media,
6. Visit to hospital for demonstration of Biomedical waste management.

There shall be no University Practical Examination.

REFERENCE BOOKS

- Anathanarayana & Panikar Medical Microbiology
- Roberty Cruickshank – Medical Microbiology – The Practice of Medical Microbiology
- Chatterjee – Parasitology – Interpretation to Clinical medicine.
- Rippon – Medical Mycology
- Monica Cheesebrough
- Silvertone : Introduction to Medical Lab. Technology

Course code: BMT 105

BIOCHEMISTRY

Theory classes: 60 hours, Practical classes : 30 hours

Theory

Unit.1 Introduction, specimen collection and Handling

- Introduction to Bio-chemistry including code of ethics for Medical Lab technicians and Medical Lab Organization.
- Reception, Registration and Bio-chemical parameters investigated.
- Types of vials used in blood /specimen collection
- Anticoagulants
- Preservatives
- Blood collection
- Precautions
- Safety, first aid, Biological and chemical hazards
- Processing of samples
- Preservation
- Disposal of samples
- Introduction to laboratory apparatus :
 1. Pipettes - different types (Graduated, volumetric, Pasteur, Automatic etc.), Calibration of glass pipettes
 2. Burettes, Beakers, Flasks, Funnels, Cuvettes,

Unit 2. Units of measurements and Basics of Instrumentation

- Conventional and SI units
- Molecular weight, equivalent weight of elements and compounds, normality, molarity,
- Preparation of molar solutions, normal solutions, Percent solutions

Unit.3 Carbohydrates :

Definition, biological importance, classification, qualitative tests, Digestion & Absorption

Unit.4 Lipids :

Definition, biological importance, classification, Acid value, Iodine value, saponification value, Digestion & Absorption.

Unit.5 Aminoacids and Proteins :

Definition, biological importance, classification, qualitative tests.

Unit.6 Vitamins :

Vitamins : Classification of Vitamins, Sources, Daily requirements, Deficiency diseases. (In Brief)

Unit.7 Enzymes

Nature, Classification, Factors affecting enzyme activity, Enzyme Inhibition

Unit.8 Nucleic acids- Chemistry and functional aspects

Purine bases, Pyrimidine bases, nucleosides, Nucleotides, DNA & RNA, Their functions

Practical:

- Reception and registration
- Collection of Capillary blood
- Collection of Venous blood
- Separation of Serum from clotted blood
- Separation of plasma from blood
- Lab glass ware
 - a) Identification b) Handling c) Care and Maintenance d) Uses
- Lab instruments
 - a) Centrifuges b) Balances c) Photo Electric colorimeter d) Spectrophotometer
- Preparation of
 - a) Percentage solutions b) Normal solutions c) Molar solutions
- Qualitative identification of tests of sugars
- Qualitative identification of tests of proteins
- Qualitative identification of tests for amino acids

There shall be no University Practical Examination.

REFERENCE BOOKS

- Text book of Biochemistry by Satynarayan
- TEITZ – Clinical chemistry
- Vasudevan (DM) Sreekumari(S) Text book of
- Biochemistry for Medical students ,Latest Ed
- Varley – Clinical chemistry
- Kaplan – Clinical chemistry

Course code: BMT-S-101

HEALTH CARE

Theory classes: 30 hours

Unit 1. Introduction to Health

- Definition of Health
- Determinants of Health
- Health Indicators of India
- Health Team

Unit 2. Health Policy and Programmes

- ◆ Concept.
- ◆ National Health Policy
- ◆ National Health Programmes (Briefly Objectives and scope)
- ◆ Population of India and Family welfare programme in India

Unit 3. Introduction to Nursing

- I. What is Nursing ? Nursing principles.
- II. Inter-Personnel relationships.
 - ◆ **Bandaging** : Basic turns; Bandaging extremities; Triangular Bandages and their application.
- III. Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.
 - ◆ **Lifting And Transporting Patients**: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.

Unit 4. Bed Side Management:

- ◆ Giving and taking Bed pan, Urinal :
 - ◆ Observation of stools, urine.Observation of sputum,
 - ◆ Understand use and care of catheters, enema giving.
 - ◆ **Methods Of Giving Nourishment**: Feeding, Tube feeding, drips, transfusion
 - ◆ Recording of body temperature, respiration and pulse,
 - ◆ **Simple aseptic technique**: Sterlization and disinfection.
1. Surgical Dressing: Observation of dressing procedures

Unit 5. First Aid :

- Syllabus as for Certificate Course of Red Cross Society

Course Code: E - 101

ENGLISH

Theory classes: 60 hours

Practical classes: 30 hours

There will be two papers in English at the FYBSc as per the revised syllabus E-101 (Theory) will be taught for two hours a week and E-102 (Practical) will also be taught for two hours a week/per Batch each form the academic year 2009-10

Language Skills like Reading and Writing will be covered in E-101 and Listening and Speaking will be covered in E-102 which will also have Lab Session of two hours per week.

Aim

These two course will aim at helping the course participants develop their communication skills in English by training them in handling all the four language skills effectively. The learners will be able to listen, speak, read and write in English adequately so that they could participate in various activities and perform satisfactory the different tasks listed below.

Overall Objectives

The objectives are to develop abilities

- To process information using a variety of media
- To use appropriate phrases for performing language functions
- To edit, select and present information in a format / perspective
- To listen and reduce information to a point form
- To read and to expand from points to paragraph
- To predict, comprehend, infer and synthesize information
- To question, probe and arrive at information through discussions, dialogues and interviews
- To answer questions, choose and provide data etc.

E-101 (Theory) : 2 Credits : 2 hours week

A. Reading

The objectives are to enable the students to

- ◆ Read for information news features, articles, newspaper and text
- ◆ Read intensively a collection of short stories given in a compiled text (See for the text and the lessons selected from it below)

Book prescribed

L.A.Hill (1970), **Contemporary Short Stories**. Chennai: Oxford University Press. The following stories have been selected for use on the course.

- The happy Prince
- A Horseman in the sky
- The wolves of cernogratz
- The Mark of Vishnu
- The Trust Property

B. Writing

The objectives are to enable the students to

- Form words properly using prefixes / suffixes (See list 4 in the Appendix)
- Use phrasal verbs (See list 3 in the Appendix)
- Use appropriate and related registers (See list 5 in the Appendix)
- Writing paragraphs, developing points / ideas
- Writing resume, job applications, letters of invitations (inviting / accepting/ declining), letters of complaint to civil authorities, Note taking

- Answering questions based on the prescribed text: **Contemporary Short Stories**

Books Recommended

- ◆ Champa Tickoo and Jaya Sasikumar (2000). **Writing with a Purpose**, Chennai, OUP
- ◆ David Jolly (1988). **Writing Tasks**: An authentic task approach to individual writing needs.

E-102 (Practicals) : 2 hours week

C. Listening

The objectives are to enable the students to listen and understand

- Short lecture, descriptions, and narrations, rapid talks, passages read aloud and/or dictated and identify Language functions (See list 2 in the Appendix)
- Conversations based on familiar situations, and
- Note Making

Books Recommended

- ◆ Spoken English-D Sasikumar and PV Dhamija (with Audio Cassette) Tata McGraw Hill

D. Speaking

The objectives are to enable the students to

- Use greeting and formula in everyday conversations.
- Use various notions and function of everyday usage (See list 2 in the Appendix)
- Use grammatically correct and appropriately structures to organize thought (See list 1 Containing Syntactic items in the Appendix)
- Give short formal and informal talks, speeches

Books Recommended

- Grant Taylor. English Conversation Practice. New Delhi: Tata McGraw Hill
- R.P.Bhatnagar and R.T.Bell (1999) **Communication in English**, Hyderabad: Orient Longman

Testing: Division of Marks

E – 101 (Theory)

Q.1	Answer in Brief. (In not more than three sentences)	14 marks
Q.2	Short Notes (Any Two)	06 marks
Q.3	Multiple Choice	
	• Content based questions	05 marks
	• Expressions / Idioms / Difficult words	05 marks
	• Connectives	04 marks
	• Concord	04 marks
Q.4	(A) Comprehension (Unseen Passage) OR Paragraph Writing	08 marks
	(B) Letter Writing	08 marks
	• Formal Letters- Letters of complaint, Invitation- Extending/declining, Resume building/ Applications	
Q.5	(A) Phrasal Verbs	04 marks
	(B) Registers	02 marks

E – 102 (Practical)

- Listening 15 marks
- Dictation 05 marks
- Reading A loud 10 marks
- Viva + Journal 10 + 5 marks
- Note Making 10 marks
- Vocabulary 05 marks

60 marks (60/2 = 30)

BHAIKAKA UNIVERSITY

**S.Y. B.Sc.- Medical Technology in
Imaging Technology**

Curriculum

Sr. No.	Subject	Course No.	Teaching Hours
Main Subjects			
1	Section A -Radiation Physics	BMT-IMT-201	60
	Section B- Medical Physics		
2	Radiographic Techniques I	BMT-IMT-202	60
3	Radiographic Photography And Image Processing	BMT-IMT-203	60
	Practical	BMT-IMT-203-P	90
Main Subjects- Teaching hours			270
Subsidiary subjects			
4	Bio-ethics		20
5	Computer Organization & PC Software	BMT-S-202	25
6	Practical- Computer Organization & PC Software	BMT-S-203-(P)	25
Subsidiary subjects- Teaching hours			70
Teaching hours-Theory/Practicals			340
Hospital Posting			540
Total Teaching hours			880

S.Y.B.Sc.- Medical Technology
(in Imaging Technology)

Table 1. Subjects, Credits and Scheme of Examination

Sr. No.	Subject	Course No.	No. Credits per week	Duration of Uni. Exam	External Marks	Internal Marks	Total	Grand Total
1	Section A: Radiation Physics	BMT-IMT-201	2	3	80	20	100	100
	Section B: medical Physics							
2	Radiographic Techniques I	BMT-IMT-202	2	3	80	20	100	100
3	Radiographic Photography and Image Processing	BMT-IMT-203	2	3	80	20	100	100
3	Practicals –Imaging Technology	BMT-IMT-204(P)	2	1 days	80	20	100	100
4	Bioethics	BMT-S-201	1	2	40	10	50	50
	No practical Exam	-	-	-	-	-	-	
5	Computer Organization & PC Software	BMT-S-202	1	2	40	10	50	80
	Practical- Computer Organization & PC Software	BMT-S-202(P)	1	-	25	5	30	
Total								530

**Syllabus for Second year
B.Sc.- Medical Technology in Imaging Technology**

Course code: BMT-IMT- 201

SECTION A- Radiation Physics

Principles Of Radiation Detection And Measurement:

Gas-Filled Detectors (Ionization Chambers, Proportional Counters And Geiger Muller Counters) Scintillation Detectors, Thermoluminescent Dosimeters (Tld). Reasons For Choice Of Air-Ionization. Roentgen And Rad. Simple Principles Of Dosimeters.

Biological Effects Of Radiation :

Chemical Effects Of Radiation - Radiolysis Of Water ; Production Of Free Radicals, Radicals Reactions, G-Value. Effects Non-Stochastic Effects, Chromosome Aberrations And Mutations. Radiation Effects On Whole Body (Early Effects And Late Effects). Concept Of Doubling Dose. Risk Factors.

Radiation Protection:

Principle Of Radiation Protection - Historical Development, Maximum Permissible Exposure Concept ; Annual Dose Equivalent Limits (Adel) A.L.A.R.A.(As Low As Reasonably Achievable) Concept ; International Recommendations And Current Code Of Practice For The Protection Of Persons Against Ionizing Radiation's From Medical And Dental Use.

Protective Materials: Lead, Lead - Impregnated Substances, Building Materials, Concept Of Barriers, Lead Equivalents And Variations With Quality. Design Of X-Ray Tubes Related To Protection. Structural Shielding Design (Work-Load, Use Factor, Occupancy Factor, Distance) Departmental Protection. Radiation Protection Of Staff Members, Patients And Public. Protection Instruments & Personnel And Area Monitoring.

Suggested Books For Reference:

Farr RF & Allisy-Roberts PJ : Physics for Medical Imaging (Saunders-An imprint of Elsevier) 1st Edition 2006

SECTION B- Medical Physics

Mains Supply:

Generation Of Electrical Energy, Distribution Of Electrical Energy, Use Of Electrical Energy, Polyphase Supplies, Availability Of Different Voltages, Feeder Cables, Line Voltage Drop; Mains Switches, Fuses, Circuit Breakers. Earthing, Insulation, High Tension Cables Construction , Design.

Diagnostic High Tension Circuits :

Self Rectified, Half-Wave, Full-Wave, 4 Rectifier, 3 Phase, Capacitor Discharge, Constant Potential. Main Voltage Compensation, Mains Resistance Compensation, Compensations For Mains Frequency Variation. Control Of Tube Voltage, Kilovoltage Compensation; Filament Circuit, Control Of Tube Current, Space Charge Compensation. High Tension (Tube Selector) Switch. Meters- Function; Use Of Shunts. Meters Commonly Found In Diagnostic X-Ray Equipment, Position In Circuits, Reading Meters.

Switching And Timing:

Exposure Timers, Spring Activated, Synchronous, Electronic, Auto Timers, Exposure Switching -Mechanical Contactors, Electronic Switching In Low Tension And High Tension Circuits. Interlocking Circuits - Use Of Relays, Tube Overload Protection. Circuit Diagrams - Simple Circuit Diagrams As Illustration Of Sequence From Mains Supply To Controlled X-Ray Exposures, Block Diagrams.

X-Ray Tubes:

Rotating Anode X-Ray Tubes, Design, Rating, And Use Of Rating Charts, Care Of The X-Ray Tubes; Inherent Filtration And Additional Filtration; Practical Considerations In The Choice Of Focus; Speed Of Anode Rotation; Angle Of Anode Inclination. Grid-Controlled X-Ray Tube.

Control of Scattered Radiations:

Cones, Tube Diaphragms,. Single And Multileaf Grids, Structure And Materials; Grid Ratio And Lines /Cm. Parallel And Focussed Grids, Stationary Grids, Crossed Hatched Grids. Gridded Cassettes, Grid Movements, Potter-Bucky Diaphragms ; Single Stroke, Reciprocating And Oscillating Mechanisms; Beam Centring Devices - Centre Finders, Optical Centring Devices, Light Beam Collimators.

Equipments:

I Fluoroscopy and Image Intensifiers:

Direct Fluoroscopy, Fluoroscopy Image, Fluoroscopic Screen, Explorators (Serial Changers, Spot Film Devices) And Accessories. Radiation Protection Including Integrating Timer. Tilting Tables. Principles And Construction Of Image Intensifiers, Television Camera Tubes And Cathode Ray Tubes. Recording The Intensified Image, Methods Of Viewing The Intensified Image, Equipment For Fluorography And Cine-Fluorography. Radiographic and Fluoroscopic Tables, Telecommand Tables.

li **Equipment for Special Procedures:**

Special Trolleys And Chairs, Portable And Mobile X-Ray Units, Cordless Mobile X-Ray Equipment, Capacitor Discharge Mobile Equipment, Equipments For O.T. Bi-Plane Radiography, Cranial And Dental Equipment, Skull Tables, Mammography, Mass-Miniature Radiography, Tomography (Conventional X-ray Tomography is obsolete after availability of computed Tomography (CT) scan. Only historical importance), Multi Section Cassettes, Rapid Cassette Changer, Rapid Film Changer, Magnification Radiography, Subtraction Radiography.

lii **Care and Maintenance of X-Ray Equipment:**

General Principles Of routine care. General Care In Use And Special Care Of Mobile Equipments. Simple Test. Uses Of Spinning Top And Step Wedge, Checks On Generator Output; Check For Integrity Of Tomographic Equipment; Procedure For Obtaining Radiograph Of The small area of body. Use Of Ma (milli Ampre) And Timer Wisconsin Test Tool, Test Of Kilo Voltage, Wisconsin Test Cassette, Use Of Focal Spot Test Tool, Testing Light Beam Diaphragm, Failures Of X-Ray Tubes And Ht Cables.

Course code: BMT-IMT- 202

Radiography Techniques -I

Preparation Of The Room, Apparatus And Instruments

Positions Of The Patient: Erect, Sitting, Supine, Prone, Lateral, Oblique, Decubitus Etc., Relative Position Of X-Ray Tube And Patient, Relevant Exposure Factors. Use Of Accessories Such As Radiographic Cones, Grid And Positioning Aids.

Anatomic And Physiological Basis Of The Procedure, Association of Theory With Practical Work.

Radiographic Appearances, Both Normal And Common Abnormal Conditions Where Elementary Knowledge Of The Pathology Involved Will Ensure The Application Of The Appropriate Radiographic Technique. Modifications In Technique For Various Disabilities And Types Of Subject. Radiation Protection, Use Of Gonad & Thyroid Shield, Practical Methods Reducing Radiation Dose To The Patient.

Upperlimb:

Routine Projections For The Whole Hand, Fingers, Wrist Joint, Forearm, Elbow Joint And Humerus. Supplementary Projections For Scaphoid, Carpal Tunnel Ball Catchers Projections, Head Of The Radius, Supracondylar Fracture And Olecranon Process.

Lowerlimb:

Routine Projections For The Whole Foot, Toes, Calcaneum, Ankle Joint, Leg, Knee-Joint, Patella And Femurs.

Supplementary Projections For Talo-Calcaneal Joint, Forced Projections For Torn Ligaments, Flat Feet, Club Feet, Intercondylar Projections For Loose Bodies In The Knee, Axial Projection For Patella.

Shoulder Girdle And Thorax:

Routine Projections For The Shoulder Joint, Scapula, Acromio-Clavicular Joint, Clavicle, Sternoclavicular Joint, Sternum And Ribs.

Supplementary Projections For The Axial Projection Of Clavicle, Bicipital Groove Carotid Process, Classification Of Tendons, Subluxation, Upper Ribs, Lower Ribs And Axillary Ribs.

Pelvic Girdle And Hip Region :

Routine Projections For The Whole Pelvis, Sacro-Iliac Joints, Hip Joint And Neck Of Femur.

Supplementary Projections For The Greater And Lesser Trochanters Of Femur. Frog Leg Projection, Ischium Symphysis Pubis, Ileum, Acetabulum And Congenital Dislocation Of Hip Arthrodesis.

Vertebral Column:

Routine Projections For Atlanto-Occipital Joint, Cervical Spine, Cervico Thoracic Junction, Thoracic Spine, Lumbar Spine, Lumbo-Sacral Region, Sacrum And Coccyx.

Supplementary Projections For The Intervertebral Foramina, Posterior Arch Of Atlas, Flexion And Extension Of Cervical Spine, Scoliosis And Kyphosis, Sacro Iliac Joint.

Skeletal Survey:

Skeletal Survey For Metabolic Bone Diseases, Metastases, Hormonal Disorders, Renal Disorders.

Skull:

Routine Projections For Cranium And Facial Bones.

Supplementary Projections For Trauma, Towne's & Method, Sella, Turcica, Optic Foramina, Jugular Foramina, Temporal Bones, Mastoids Petrous Bone, Zygomatic Arches, Orbits, Maxillae, Nasal Bones, Mandible, Temporomandibular Joints.

Nasal Sinuses:

Techniques For Frontal, Maxillary, Ethmoidal And Sphenoid Sinuses, Erect And Horizontal Projections For Fluid Levels.

Teeth:

Routine Projections Of All Teeth –: Intra-Oral And Extra-Oral Projections.

Supplementary Projections For Localisation Of Roots, Children, Edentulous Subjects And Use Of Occlusals And Bitewings, Orthopantomography.

Chest:

Routine Projections For Lungs, Cardia And Diaphragm.

Supplementary Projections For Opaque Swallow, Thoracic Inlet, Soft Tissue Neck, Decubitus, 'Apicograms, Paediatric Cases.

Abdomen:

Kub, Erect Abdomen And Decubitus Projection, Supplementary Projections For Acute Abdomen.

Course code: BMT-IMT- 203**Radiographic Photography And Image Processing****Dark Room Planning:**

For A Small Hospital, For A Large Hospital, Location Of Dark Room

Construction Of Dark Room, Ventilation, Wall Protection, Entrance To Dark Room - Single Door, Double Door, Labyrinth

Dark Room:

Instruction To Staff, Dry Bench, Hopper, Drawer, Cupboard, Loading And Unloading Cassettes Hangers, Types Of Hangers And Storage Of Hangers, Printing, Wet Bench, Cleanliness, Control Of Dust, Dark Room Sink, Hatches, Drier, Safe Lights, Direct And Indirect, Uses, Factors Affecting Safelight Performance, Safelight Tests, Viewing Room, Film Dispensing

X-Ray Films:

Glass, Cellulose And Polyester Bases

Structure Of X-Ray Films - Emulsion, Gelatin, Base And Supercoating

Types Of X-Ray Films, Single Coated, Duplitised, Spectral Sensitivity, Colour Sensitivity

Graininess Of Films, Speed Of Films, Screen & Non-Screen Films, Various Formats Of Films

Films For Special Procedures

Storage Of Film Materials And Radiographs, Record Of Film Stock And Radiographs

Deterioration Of Films On Storage, Characteristic Curves - Uses Of Step Wedge

Information On Basic Fog, Film Gamma, Contrast, Speed, Film Latitude,

Effects On Development

Intensifying Screens:

Fluorescence - Phosphors

Phosphors Employed :- Calcium Tungstate, Barium Fluochloride etc.

Rare Earths

Construction Of Intensifying Screens

The Influence Of Kilovoltagage In Different Phosphors

Intensification Factor

Resolving Power Of Intensifying Screens

Speed Of Screens

Screen Film Contact Tests

Types Of Intensifying Screens

Advantages And Limitations Of Intensifying Screens.

X-Ray Cassette:

Construction Of X-Ray Cassettes, Types Of Cassettes, Mounting Intensifying Screens On

Cassettes, Identification Of Cassettes, Care Of Cassettes

Photochemistry:

Chemistry Of Image Formation, Formation Of Latent Image, Conversion Of Latent Image To Visible Image, Meaning Of Ph, Importance Of Ph In Processing Films

Processing Methods:

Preparation Of Solution , Manual Processing Apparatus, Control Of Temperature,

Replenishment, Rapid Processing

Automatic Processor - Principle And Features, Water Supply, Use Of Thermostat, Regeneration Of Solutions, Maintenance, Advantage And Limitations. Processing Of Cut Films And Roll Films.

Computer Photography.

Digital Radiography - Principles, Processing, Equipments, Advantages.

Radiological Information Systems.

The Radiographic Image:

The Emergent Beam Related To Densities On Film Contrast - Objective And Subjective, Long Scale And Short Scale, Radiation Contrast, Film Contrast And Radiographic Contrast, Density Sharpness, Sources Of Unsharpness, Avoiding Different Unsharpness

Resolution

Factors Affecting Resolution Choice Of Kilovoltage And Milliamperage Choice Of Short Focus And Broad Focus Selection Of Focus To Film Distance And Object To Film Distance Selection Of Cassettes

Avoiding Scatter Radiation, Magnification, Distortion, Penumbra Presentation of a Radiograph - Identification Markers - Name Printer

Viewing Equipment Magnifiers for Cut Films and Roll Films

Developer:

Constituents, Characteristic, Manual and Automatic Processors, Effects on Developing Time, Temperature, Agitation, Replenisher, Exhaustion

Rinsing:

Acid Stop-Bath, Methods, Objects

Fixer:

Constituents, Characteristics, Manual and Automatic Processors, Fixing Time and Clearing Time
Factors Affecting Fixing Time, Replenisher, Exhaustion

Washing and Drying:

Objects, Methods, Factors Affecting Washing and Drying, Wetting Agents, Comparison of
Different Methods

Day Light Film Handling:

Day Light System Using Cassettes

Day Light System without Cassettes

Film Faults:

Fog - Various Fogging In Films, Causes And Prevention. Stains - Types, Causes And Prevention
Spots And Splashes - Types, Causes And Prevention Marks And Prints - Types, Causes And
Prevention Drying Marks - Types, Causes And Prevention Faults In Automatic Processor -
Types, Causes.

Reproduction Of Radiographs:

Copying Radiographs

Magnification and Minification.

Contact Prints

Types Of Paper

Equipment

Practicals

A). Cassette And Intensifying Screens

B). Chemical Used In Film Processing

C). Films Used In Photography And Printers

D). Diagnostic Image Processing _____

Imaging Technology: Practical

Course code: BMT-IMT- 203

Radiographic Technique I

Radiography - Plain Views of Upper Limb: Hands

Fingers ,Thumb, Wrists, Forearm, Elbow, Humerus

Radiography - Plain Views of Shoulder:

Shoulder Joint, Acromio - Clavicular Joint, Scapula Various Views And Projections, Clavicle, Sterno - Clavicular Joint

Radiography - Plain Views of Lower.Limb:

Foot, Toes,Tarsus & Oscalcis, Ankle, Tibia, Fibula & Patella, Knee Joint, Femur, Hip Joint Pelvis & Sacro-Ilic Joint

Radiography Of Vertebrae:

Cervical Spine Upper, Cervical Spine Lower, Cervico-Thoracic, Cervico-Middle, Thoraco-Lumbar, Lumbo-Sacral, Sacrum & Coccyx, Ribs-Upper & Lower, Sternum

Radiography of Skull Plain Views:

Ap, Lateral & Towns, Sinuses, Mandible, Equipment,Teeth Mastoids

Radiography Of Chest:

Lungs & Trachea; Heart-Diaphragm

Radiography of G.I. Tract

Plain X-Rays Abdomen-Erect; Liver, Spleen.

Reference Book:

1. Philip W.Ballinger: Merrill's Atlas Of Radiographic Positioning And Radiological Procedures (Mosby)
2. Ra Swallow, E Naylor: Clarks Positioning In Radiography E J Roebuck, A S Whitley
3. Sante Lr: Roentgenologic Technique (Edwards Inc)
4. Goldman: A Radiographic Index
5. Ross And Gailway: A Handbook Of Radiography (Lewis)
6. Glenda J.Bryan: Diagnostic Radiography (Mosby)
7. Piles: Medical Radiographic Technique (Thoms).
8. L.C.Gupta & U.C.Sahn : Radiography for Technicians (Jayee Brothers)

BHAIKAKA UNIVERSITY

S.Y.B.Sc. - Medical Technology

Bioethics

(Common to all specializations of Medical Technology)

Course Code: BMT-S-201

Goals

1. Provide a sense of responsibility and professionalism when interacting with patients, peers, fellow employees, and other health care providers.
2. Communicate effectively and professionally.
3. Instill the importance of honesty and professionalism in the workplace.

By the end of this module, the student should be able to:

1. Exhibit behavior consistent with the ethical practice of Medical Technologist.
2. Maintain confidentiality of all patients and test results.
3. Demonstrate an appreciation for the special knowledge and talent of other members of the health care team.
4. Explain the transmission of the AIDS/HIV and state how the virus affects the Immune system.

Methods of Presentation

Lecture, Discussion, Audio-Visual materials

Duration : 20 hours

COURSE CONTENT

1. Values of life (Philosophy)/in clinical practice & Definition of medical ethics. **1 hour**
2. History of Medical Ethics: **2 hour**
 - ◆ Indian perspectives : Charaka,Susruta
 - ◆ The Hippocratic Oath
 - ◆ Declaration of Helsinki
 - ◆ WHO Declaration of Geneva
 - ◆ International code of Medical Ethics
3. Ethical problems of life **2 hour**
 - Right to life, prenatal screening / sex selection
 - Abortion, **feticide**

 - Assisted reproductive technologies
 - Genetic testing
 - Genetic engineering, cloning
 - Care of terminally ill
 - Death and dying
 - Euthanasia

- | | | |
|---|--|---------------|
| 4. | Family and society in medical ethics : | 2 hour |
| | <ul style="list-style-type: none"> • Children : Age to consent for treatment parent- Child – clinician conflict • Mental Disorders and disabilities • HIV / AIDs | |
| 5. | Etiquette and mannerism | 2 hour |
| 6. | Good communication skill | 2 hour |
| | <ul style="list-style-type: none"> • Truthfulness, Building trust, Honesty with patients • Communication with colleagues, seniors and subordinates | |
| 7. | Confidentiality | 1 hour |
| | <ul style="list-style-type: none"> • Malpractice, negligence • Medical ethics and law | |
| 8. | Code of ethics: (Please refer Annexure for elaborations) | |
| | <ul style="list-style-type: none"> • Duties to Patients 1 hour • Duties to Colleagues and other Professionals: 1 hour • Duties to Yourself: 1 hour • Duties to Society: 1 hour • Duties to your Profession: 1 hour • Specific issues: 1 hour | |
| Internal Evaluation:
(Problem based questions, Short notes, MCQ, Viva) | | 2 hour |

EVALUATION : TOTAL: 50 marks

Internal evaluation:		10 marks
External Exam (One paper of 2 hours):	40 marks	
<ul style="list-style-type: none"> • Problem oriented question • Short notes • Short answer questions 		

There will no Practical Exam for this course.

SUGGESTED BOOKS/LITERATURE:

1. MEDICAL ETHICS, by C.M.Francis, Jaypee Brothers
 2. Current Problems in Medical ethics, by George V. Lobo, St. Paul's Society, Allahabad.
 3. Ethics for Doctors, Nurses & Patients by H.P. Dunn, St. Pauls Bandar, Mumbai.
-

ANNEXURE

CODE OF ETHICS: Medical Technology

Code of Ethics, under different categories, has been elaborated hereunder as applied to the profession of Medical Technician/Technologist. It is however suggested that these elaborations are only indicative and not exclusive. There could be many more situations/events, depending on the nature of work involved in different types of specialization of Medical Technology; which would also be deemed to be a part of the curriculum as and when identified.

1. Code of Ethics: Duties to Patients:

- accountability for the quality and integrity of the services they provide.
 - respect patients' privacy and dignity
 - treat patients politely and with consideration
 - apply the principle of informed consent as an on-going process
 - recognize the rights of patients to maintain confidentiality of information in the course of professional duties, unless they agree to disclosure or the law demands
 - patients' permission before sharing information with their spouses, partners or relatives.
 - always seek to give priority to the service to be provided to patients solely on the basis of clinical need.
-
- Code of Ethics: Duties to Colleagues and other Professionals:
 - Should not make a patient doubt a colleagues' knowledge or skills by making comments about them that cannot be fully justified.
 - ◆ Work with and respect other health care professionals in pursuit of the best health care possible for all patients.
 - ◆ Should not discriminate against colleagues, including professionals applying for posts, because of views of their race, culture, ethnicity, social status, lifestyle, perceived economic worth, age, gender, disability, communicable disease status, sexual orientation, religious or spiritual beliefs, or any condition of vulnerability.
 - ◆ Refrain from speaking ill of colleagues or other health care professionals.
 - ◆ Actively strive to establish cooperative and respectful working relationships with other health care professionals with the primary objective of ensuring a high standard of care for the patients they serve.
 - ◆ Share their knowledge with colleagues and promote learning.
-
- Code of Ethics: Duties to Yourself :
 - Maintain and improve the standard of your performance by keeping your professional knowledge and skills up to date throughout your working life. In particular, regularly take part in educational activities that relate to medical laboratory science.
 - Acknowledge the limits of your professional knowledge and competence. Do not pretend to know everything.
 - Use equipment and laboratory ware correctly and with care.
 - Refrain from engaging in activities that may affect your health and lead to impairment.
 - Aware laws and regulations governing medical laboratory technology and shall apply them in the practice of your profession.
 - Not wasting reagents and other laboratory supplies unnecessarily.
Never taking anything from place of work that does not belong to you
-
- Code of Ethics: Duties to Society

- Refrain from providing a service that is not needed, whether it provides financial gain or not.
 - Refrain from unnecessary wastage, and from participating in improper financial arrangements, especially those that escalate costs and disadvantage individuals or institutions unfairly.
 - Dedicate to serve the healthcare needs of the public
- Code of Ethics: Duties to your Profession
 - Uphold and maintain the dignity and respect of medical laboratory profession and strive to maintain a reputation of honesty, integrity and reliability.
 - Contribute to the advancement of the profession by improving the body of knowledge, adopting scientific advances that benefit the patient, maintaining high standards of practice and education, and seeking fair socioeconomic working conditions for members of the profession.
- Specific issues: Any other issues specific to a particular specialization of Medical Technology profession not categorized in any of the above.
-

BHAIKAKA UNIVERSITY
S.Y.B.Sc. - Medical Technology
Computer Organization and PC Software
(Common to all specializations of Medical Technology)

Course Code: BMT-S-202

Objective:

At the end of this course, a student would be able to :

- ◆ identify various components of computer hardware and
- ◆ use some software in order to manage data related to the profession.

Teaching hours: Theory: 25 hours
 Practicals: 25 hours

Curriculum:

SECTION A

Unit 1. Computer Organization -I

Generations of a computer, types of a computer, some important terms: hardware, software, program, operating system, interpreter, compiler, assembler, high level languages, bits and bytes.

Introduction to number systems

Unit 2. Computer Organization -II

Processors, CPU organization, primary memory, memory addresses, secondary memory, memory hierarchies, magnetic disks, CDRoms, DVDs, input/output devices: keyboards, monitors, mice, printers, modems

The concept of character codes

SECTION B

Unit 1: PC Software- I

Introduction to spreadsheets, the concept of cells and cell addresses, formulas, some important functions, introduction to charts

Introduction, features and applications of a DBMS

Database objects

Tables – creation, modification, deletion

Working with data – insertion, modification, finding, sorting, grouping, viewing and sharing data

Unit 2. PC Software- II

Forms – creation of forms; modification, viewing and validating data using forms, subforms

Reports – creation, modification, opening, viewing

Creating mailing labels

REFERENCE BOOKS:

1. Tanenbaum A. S., Structured Computer Organization, 4th Edition, Prentice-Hall of India Pvt. Ltd., 2002.
2. Elmasri, Navathe, Somyajulu, Gupta, Fundamentals of Database Systems, Pearson Education, 2006.
3. Progue, Irwin, Roardon, Microsoft Office Access 2007 Bible, Wiley Publishing Inc., 2007.
4. Taxali R. K., P C Software for Windows 98 Made Simple, Tata McGraw-Hill, 2001.
5. Hall D. V., Microprocessors and Interfacing, McGraw-Hill Book Company, 1986.
6. Desai Bipin C., An introduction to Database Systems, 7th Edition, Pearson Education Asia, 2001.

BHAIKAKA UNIVERSITY
T.Y. B. Sc.- Medical Technology
in
Imaging Technology
Curriculum

Sr. No.	Subject	Course No.	Teaching Hours
1	Diagnostic Imaging Techniques	BMT-IMT-301	60
2	Radiographic Techniques -Applied	BMT-IMT-302	60
3	Radiographic Techniques -Advanced	BMT-IMT-303	60
4	Practical - Radiographic Techniques	BMT-IMT-304(P)	90
Teaching hours			270
Hospital Posting			750
Total hours			1020

R. BMT.IMT.1: *Internship*

With reference of Rule No. R. BMT. 2 (First Year B.Sc. - Medical Technology); the course of B.Sc. - Medical Technology in *Imaging Technology* shall be having a compulsory Internship during the fourth year.

- (a) Internship shall be commenced only after the candidate is declared pass in all the subjects & practical of T.Y.B.Sc. and/or previous year's A.T.K.T., if any.
- (b) The Internship shall be commenced soon after the announcement of result of T.Y.B.Sc.- Medical Technology (Imaging) from a date as notified by the Principal of the affiliated Institute and would continue for continuous twelve months; with one leave per month permissible.
- (c) The degree of B.Sc. will be awarded by BHAIKAKA University only on successful completion of Internship.

**T.Y.B.Sc.- Medical Technology
(in Imaging Technology)**

Table 1. Subjects, Credits and Scheme of Examination

Sr. No.	Subject	Course code No	No. Credits per week	Duration of Uni. Exam	External Marks	Internal Marks	Total
1	Diagnostic Imaging Techniques	BMT-IMT-301	2	3 hrs	80	20	100
2	Radiographic Techniques - Applied	BMT-IMT-302	2	3 hrs	80	20	100
3	Radiographic Techniques -Advanced	BMT-IMT-303	2	3 hrs	80	20	100
4	Practical - Radiographic Techniques	BMT-IMT-304(P)	2	1 day	160	40	200
	Grand total				400	100	500

Syllabus for Third year
B.Sc- Medical Technology in Imaging Technology

Paper I. Diagnostic Imaging Techniques

Course Code: BMT - IMT-301

(A) Imaging Technique:

Computed Tomography:

- History
- Principles Of Computed Tomography
- Generations - Spiral C.T.
- Instrumentation.
- Data Acquisition
- Data Presentation
- Image Reconstruction
- 2 D And 3 D Images
- Image Display
- Pixel And Voxel
- C.T. Number
- Window Level And Window Width
- Scan Artefacts
- Patient Positioning In Computed Tomography
- Contrast Materials And Administration.
- Basic Diagnostic Aspects
- Interventional C.T. Guided Procedures
- Documentation.
- Safety Consideration - Radiation Dose
- Quality Assurance.

Magnetic Resonance And Imaging:

- History
- The Spinning Proton - Magnetisation, Precession, Larmor Frequency
- Radio Frequency Pulse And Proton - Resonance, Free Induction Decay, Relaxation, T-1 & T-2
- Instrumentation - Magnet, Shim Coils, Gradient Coils, Radio Frequency Transmitter And Receiver Coils, Computer.
- Pulse Sequences - Saturation Recovery, Spin Echo, Inversion Recovery.
- Image Production - 2d And 3d Pictures.
- Image Quality - Signal To Noise Ratio, Contrast To Noise Ratio.
- Image Artefacts.
- Flow Techniques - Magnetic Resonance Angiography Spectroscopy. Mr Contrast Agents - Paramagnetic And Ferromagnetic Documentation. Safety Consideration Quality Assurance.

Ultrasound Imaging:

- History
- Ultrasound Characteristics - Nature, Propagation, Frequency, Wavelength, Velocity, Amplitude, Intensity, Acoustic Impedance, Reflection, Refraction Etc. Interference With Media, Interface, Attenuation.
- Transducer - Piezoelectric Effect, Construction, Types Of Arrays - Mechanical & Electronic .
- Acoustic Coupling Media.
- Ultrasound Instrumentation.
- Display Modes - A Mode, B Mode, M Mode, Real Time.
- Grey Scale Imaging
- Doppler Methods - Continuous Wave Doppler, Pulsed Doppler, Duplex, Real Time Colour Flow Imaging.
- Ultrasound Artefacts.
- Patient Preparation And Handling
- Basic Diagnostic Aspects
- Interventional Techniques - Transducer Sterilisation, Needles, Diagnostic Procedures, Therapeutic Procedures.
- Documentation
- Safety Consideration - Effects Of Heating, Cavitation.
- Quality Assurance - Phantoms, Performance, Accuracy, Sensitivity, Spatial Resolution Tests.

Paper II : Radiographic Techniques - Applied

Course Code: BMT – IMT-302

Introduction :

- Responsibility Of Radiographer During Radiological Procedures.
- Preparation Of Patient For Different Procedures.
- Contrast Media - Positive And Negative, Ionic & Non - Ionic
- Adverse Reactions To Contrast Media And Patient Management
- Emergency Drugs In The Radiology Department
- Emergency Equipments In The Radiology Department
- Asepsis
- Radiation Protection - Ten Day Rule.
- The Following Should Be Dealt With Indication, Contraindications, Patient Preparation, Contrast Media Used, Method Of Administration Of Contrast Media, Accessories Required, Technique To Be Adopted, Variation In Normal Technique In Specific Circumstances, Films Taken, Complications, Precautions And After-Care Of The Patient.

Gastro - Intestinal Tract:

- Barium Swallow - Tracheo - Oesophageal Fistula
- Barium Meal - Single Contrast And Double Contrast
- Hypotonic Duodenography
- Barium Meal Follow Through
- Small Bowel Enema
- Barium Enema - Gastrograffin Enema, For Reducing Intussusception Loopogram
- Additional Investigation - Computed Tomography, Radio Isotope Scanning.
- Biliary Tract:
- Oral Cholecystography
- Intravenous Cholelithography
- Pre Operative Cholelithography
- Post Operative Cholelithography - Percutaneous Extraction Of Retained Biliary Calculi
- Percutaneous Transhepatic Cholelithography - Biliary Drainage.
- Endoscopic Retrograde Cholelithopancreatography
- Additional Investigation : Ultrasound Scanning
- Radio Isotope Scanning
- Computed Tomography

Urinary System:

- Excretion Urography
- Percutaneous Renal Puncture
- Percutaneous Nephrostomy
- Percutaneous Nephrolithotomy
- Lithotripsy
- Retrograde Pyeloureterography
- Micturating Cysto Urethrography - Urodynamic Investigations
- Ascending Urethrography
- Additional Investigation : Ultrasound Scanning
- Radio-Isotope Scanning
- Computed Tomography
- Magnetic Resonance And Imaging

Reproductive System:

- Hystero Salpingogram
- Gynaecography

- Pelvimetry
- Vesiculography
- Additional Investigations : Ultrasound Scanning
- Computed Tomography
- Magnetic Resonance And Imaging

Cardio-Vascular System:

- Angiography:
- Percutaneous Catheterization
- Catheterization Sites, Asepsis
- Guide Wire, Catheter, Pressure Injector And Accessories
- Use Of Digital Subtraction, Single Plane And Biplane
- Head And Neck Arteriography
- Pulmonary Arteriography
- Coronary Arteriography
- Ascending Aortography
- Trans Lumbar Aortography
- Celiac Axis, Superior Mesenteric And Inferior Mesenteric Arteriography
- Renal Arteriography
- Trans Femoral Arteriography
- Interventional Vascular Radiography
- Additional Investigations : Echo Cardiogram (Doppler)
- Radio-Isotope Scanning
- Computed Tomography
- Magnetic Resonance And Imaging

Venography:

- Peripheral Venography - Lower Limb, Upper Limb
- Central Venography, Superior Venacavography, Inferior Venacavography, Pelvic Venography
- Ascending Lumbar Venography, Intra Osseous Venography, Percutaneous, pleuroportography
- Transhepatic Portography, Selective Retrograde Venography - Renal Venography
- Adrenal Venography, Hepatic Venography, Internal Jugular Venography, Orbital Venography
- Interventional Vascular Radiography
- Additional Investigation: Ultrasound Imaging
- Radio Isotope Scanning
- Computed Tomography

Central Nervous System:

- Cervical Myelography - Cisternal Puncture And Lateral Cervical Puncture
- Lumbar Myelography
- Myelography With Water Soluble And Oily Contrast Media
- Air Encephalography
- Ventriculography
- Lumbar Discography
- Addition Investigations: Computed Tomography
- Radio Isotope Scanning
- Magnetic Resonance And Imaging
- Ultrasound Imaging

Respiratory System:

- ◆ Nasopharyngography
- ◆ Larynogography
- ◆ Bronchography

- ◆ Percutaneous Lung Biopsy
- ◆ Additional Investigations: Radio Isotope Scanning
- ◆ Computed Tomography
- ◆ Ultrasound Imaging
- ◆ Magnetic Resonance And Imaging

Paper III: Radiographic Techniques - Advanced

Course Code: BMT-IMT-303

Nuclear Medicine Imaging:

- History
- Isotopes And Radionuclides
- Positron Emission Tomography (Pet)
- Single Photon Emission Computed Tomography (Spect)
- Radio Immune Assay (Ria)
- Documentation
- Safety Considerations - Radiation Dose
- Quality Assurance.

Recent advances in Radiology

Miscellaneous:

- Arthrography
- Sialography
- Lymphography
- Sinography
- Fistulography
- Dach recystography
- Zeroradiography
- Thermography
- Kymography
- Duplication Radiography
- Macro Radiography
- High Kilo Voltage Technique
- Soft Tissue Radiography
- Multiple Radiography
- Subtraction Radiography
- Foreign Body Localisation
- Mobile Radiography
- Theatre Radiography
- Domiciliary Radiography
- Forensic Radiography
- Tomography.

Practical: Radiographic Technique

Course Code: BMT – IMT- 304(P)

- Barian Swallow Exam (E) Radiology Technique Ii
- Barian Meal Exam (E)
- Barian Follow Through Exam
- Barian Cenema Exam (E)
- Hypotinic Duodenography

- Barian Double Contrast Study (E)
- Intravenous Pyelography (E)
- Angiographic Studies 1 .Arterial 2. Venous
- Lymphangiographic Studies
- Myelographic Studies .
- Ventriculographic Studies
- Bronchographic Studies
- Macro Radiography Studies
- M.M.R.
- Mammography

Note: (E) Indicates Practicals Prescribed For University Examination.

Text Book Prescribed.

1. V R Narayana, Sharma Strengthen Your Writing, Orient Longman, New Delhi.

Reference Books:

- 1 Piles : Medical Radiographic Technique (Thomas)
- 2 Santel.R. : Roentgenologic Technique (Edwards Inc)
- 3 Philip Wballiger : Merils Atlas Of Radiographic Positions And Radiological Procedures (Mosby)
- 4 Goldman : A Radiographic Index
- 5 Patesson : Printed Notes For Radiographers In India (Cmai)
- 6 Achwaz : Unit Step Radiography (Thomas)
- 7 Ross & Galloway : A Hand Book Of Radiography (Lewis)
- 8 Glenda J. Bryan : Diagnostic Radiography (Churchill Livingstone)
- 9 Jacobi & Paris : Textbook Of Radiological Technology (Mosby)
- 10 Scarrow : Contrast Radiography (Schering Chemicals)
- 11 Vanderplasts : Medical X-Ray Technique (Mac Millan)
- 12 Stephen Chapman& Richare Nakielny : A Guide To Radiological Procedures (Jaypee Brothers)
- 13 R.F. Fatr & P.J. Ahisy : : Physics For Medical Imaging (Saunders)
- 14 D.N. Chesney & M.O. Chesney : : X-Ray Equipment For Student Radiographers (Cbs)
- 15 Christensen, Curry & Dowdey : : An Introduction Of Physics To Diagnostic Radiography (Lea & Febiger)
- 16 Cullinan : : Illustrated Guide Techniques (Blackwell)
- 17 Jamdrell, Thompson & Ashworth : : X-Ray Physics And Equipment (Blackwell)
- 18 Adrian K.Dixon : : Body C.T. - A Handbook (Churchill Livingstone)
- 19 John M. Stevens, Alan R. Valentine & Brian E. Kendall : : Computed Cranial & Spinal Imaging (Williams & Wilkins)
- 20 John R. Haaga, Charles F. Lanzion, David J. Sartoris & Elias A.Aerhouni : : Computerised Tomography And Magnetic Resonance Imaging Of The Whole Body (Vol.1 & Ii) (Saunders).
- 21 Philip T. English & Christine Moore : : Mri For Radiographers (Springer)
- 22 Rehani: : Diagnostic Imaging - Quality Assurance.
- 23 Pablo R.Ros & W. Dean Bidgood : : Abdominal Magnetic Resonance Imaging (Mosby)
- 24 Roger C. Sounders : : Clinical Sonography : A Practical Guide (Little Brown & Company)
- 25 Pes Palmer : : Manual Of Diagnostic Ultrasound (Who)
- 26 Sandra L Hagen Ansert: : Text Book Of Diagnostic Ultrasonography (Bi Publications).