

NIMS UNIVERSITY, JAIPUR



SYLLABUS

**BACHELOR IN MEDICAL LABORATORY
TECHNOLOGY (B.M.L.T.)**

Subject	University Examination	Internal Assessment
1. Human Anatomy	100	50
2. Physiology	100	50
3. Haematology	100	50
4. Biochemistry -I	100	50
5. Microbiology (Bacteriology & Parasitology)	100	50
6. Computer Application	100	50
7. Laboratory Instruments	200	50
8. One month hospital training	100	
Total	900	350

1st Year

Grand Total - $900+350=1250$

HUMAN ANATOMY

1. **The Human Body:-**
Definitions, subdivisions of Anatomy, Terms of location and position, fundamental planes, vertebrate structure of man, organization of the body cells, Tissues.
2. **The Skeletal system:-**
Types of bones, structure and growth of bones, Division of the skeleton. Appendicular skeleton, axial skeleton name of all the bones and their parts. Joints classification, types of movements with examples.
3. **Anatomy of Circulatory System:-**
Heart: - Size, position coverings, chambers, Blood supply, venous supply, the blood vessels, general plan of circulation, pulmonary circulation: - Names of arteries and veins and their position – lymphatic system general plan.
4. **Anatomy of the respiratory system:-**
Organs of respiratory system:-
Larynx, trachea, bronchial tree.
Respiratory portion:-
Pleurae and lungs, Brief knowledge of parts and position.
5. **Anatomy of the Digestive system:-**
Components of digestive system, Alimentary tube, anatomy of organs of digestive tube, mouth, tongue, tooth, salivary glands, liver, biliary apparatus, pancreas, names and position and brief functions.
6. **Anatomy of the nervous system:-**
Central nervous system: The Brain, hind brain, midbrain, forebrain, brief structure, locations, and peripheral nervous system. Spinal cord, Anatomy, functions, reflex – Arc, meninges. Injuries to spinal cord and brain.
7. **Anatomy of the endocrine system:-**
Name of all endocrine glands their position, hormones, and their functions- pituitary, thyroid, parathyroid, adrenal glands, gonads & islets of pancreas.
8. **Anatomy of Excretory system and reproductive system:-**
Kidneys- location, gross structure, excretory ducts, ureters, urinary bladder, urethra.
Male reproductive system: - Testis, duct system
Female reproductive system: - Ovaries Duct system, accessory organs.

HISTOLOGY

General slides:-

1. Hyaline cartilage
2. Elastic cartilage
3. Fibro cartilage
4. T.S & LS of bone
5. Blood vessels
6. Tonsil
7. Spleen
8. Thymus
9. Lymph node
10. Epithelial tissue
11. Skeletal and cardiac muscle
12. Peripheral nerve and optic nerve.

System slides:-

1. GIT – all
2. R.S.- lung trachea
3. Kidney.
4. Endocrine glands – Adrenal, pancreas, pituitary, thyroid and parathyroid
5. Uterus, ovary, testis.

Text Books & Reference Books Recommended:-

S.N	Name of books & Title	Author	Publishers Name, place of publication
1.	Human Anatomy regional and applied Val 1, Val 2, Val 3	B.D. Chaurasia	C.B.S. publishers New Delhi
2.	Hand book of general anatomy	B.D. Chaurasia	C.B.S. publishers New Delhi
3.	Text book of human histology	Inderbir singh	Jaypee brothers medical publishers, Delhi
4.	Clinically oriented anatomy	Keith L. Moore	Willims and wilkins
5.	Gray,s Anatomy	Susan standring	Elsevier Churchill Livingstone Edinburgh

PHYSIOLOGY

1. **Blood:** -

Composition, properties and function of Blood.
Haemogram (RBC, WBC, Platelet count, HB concentrations)
Function of plasma proteins Haemopoiesis
Blood Group- ABO and RH grouping.
Coagulation & Anticoagulants.
Anaemias: - causes effects & treatment.
Body fluid: - compartments, composition.
Immunity: - Lymphoid tissue
Clotting factors, mechanism of blood clotting.
Disorders of white blood cells.
Disorders of platelets.
Disorders of clotting

2. **Cardio vascular system:-**

Function of cardiovascular system.
Structure of cardiovascular system.
Cardiac cycle, functional tissue of heart & their function. Cardiac output, E.C.G., blood pressure, Heart Rate.

3. **Respiratory system:** -

Function of respiratory system, functional (physiological).
Anatomy of Respiratory system.
Mechanism of respiration, lung volumes & capacities.
Transport of respiratory gases.

4. **Digestive system:-**

Function of digestive system, functional Anatomy of digestive system, composition and functions of all digestive juices. Movements of digestive system (intestine).
Digestion & absorption of carbohydrate, proteins & fats.

5. **Nervous system:-**

Functions of nervous system, neuron- conduction of impulses, factors effecting, synapse – transmission, reception , reflexes, ascending tracts, descending tracts, functions of various parts of the Brain, cerebro spinal fluid (CSF), composition, functions & circulation, lumbar puncture, Autonomic nervous system- and its types function of (ANS) .

6. **Special Senses:-**

Vision – Structure of Eye, function of different parts, Refractive errors of and correction. Visual pathways, color vision & tests for color blindness. Hearing, structure and function of ear, mechanism of hearing, tests for hearing (deafness).

7. **Muscle Nerve Physiology:-**

Types of muscle, structure of skeletal muscle, Sarcomere. Neuromuscular junction & transmission. Excitation & contraction coupling (mechanism of contraction).

8. **Skin:-**

Structure and function of skin, body temperature, fever, regulation of temperature.

9. **Excretory System:-**

Excretory organs, kidneys, function, nephron, juxta glomerular apparatus, renal circulation, mechanism of urine formation, mechanism of micturition, cystomatogram, diuretics, artificial kidney.

10. **Reproduction System:-**

Structure and function of reproductive system. Male reproductive system: spermatogenesis, testosterone.
Female reproductive system: Ovulation, menstrual cycle Oogenesis, tests for ovulation,

estrogen & progesterone, pregnancy test, parturition, contraceptive.
Lactation: - composition of milk, advantages of breast feeding.

PRACTICAL:-

Study of microscope and its use:-

Collection of blood and study of haemocytometer. Haemoglobinometry white blood cell count, red blood cell count, determination of blood groups. Leishman's staining and differentiae WBC counts. Determination of packed cell volume, calculation of blood indices, fragility test for R.B.C., determination of bleeding time. determination of clotting time, blood pressure recording auscultation for heart sounds, artificial respiration determination of vital capacity.

Text Books & Reference Books:-

S.N	Name of books & Title	Author	Publishers Name, place of publication
1.	Text books of Physiology	Guyton (Arthor C)	Prism publishers Bangalore
2.	Human Physiology	Chatarjee (cc)	Medical allied agency
3.	Concise Medical physiology	Choudhary (Sujit km.)	New central books Kolkata
4.	Review Medical physiology	Ganang	Application and lange
5.	Human physiology	Pro. Ak. Jain	Avichal publishing Company
6.	Practical physiology	Prof. A.K Jain	Arya publishers

HAEMATOLOGY

1. Introduction to clinical haematology.
Instruments and glass wares used in haematology preparation of various stains, buffers and other solutions used in haematology.
2. Methods of collection of blood sample and anticoagulants used in different tests.
Anticoagulants for blood preservation, ACD, CPD, CPDA-1, Heparin advantages and disadvantages. Shelf life of blood, changes taking place in blood on storage. Na⁺ K⁺ etc.
3. Blood. Composition; Function and Haemeostasis -
 - a. Haematology Normal values in
 - b. Blood collection.
4. Basic haematological Techniques.
 - a. blood cell count RBC count (Red
 - b. (haemoglobin estimation) HB estimation
 - c. volume. Packed cell
 - d. absolute differential. Calculation of
 - e. total and differential. WBC count-
 - f. eosinophil count. Absolute
 - g. Platelet count.
 - h. Erythrocyte
 - i. sedimentation rate. Reticulocyte
 - j. count. Determination of
 - k. bleeding time (BT), clotting time (CT), Prothrombin time (PT) Blood indices,
 - l. calculation of RBC indices MCV, MCHC, MCHC.
5. Preparation of blood films.
6. Stains used in Haematology.
7. Morphology of red cells.
8. Morphology of Leukocytes and platelets.
9. Bone Marrow.
 - a. Techniques of
 - b. Aspiration. Preparation and staining of films. Bone marrow
 - c. biopsy.
10. Preparation of buffy coat smears.
11. Laboratory methods used in the investigation of anaemias.
 - a. Anaemias, RBC
 - b. morphology. Normal & Abnormal hypochromia. B₁₂ and foliate
 - c. assay. Schilling test.

- | | | |
|-----|---|--------------------|
| d. | iron binding capacity. | Serum iron and |
| e. | sickle cell anaemia. | Screening for |
| 12. | Preparation of smear for diagnosis of blood parasites. | |
| a. | investigations of blood parasites. | Laboratory |
| b. | | Test of L.E. cell. |
| 13. | Understanding blood related diseases. | |
| a. | | Leukemia |
| b. | | Hemophilia |
| c. | | Thalassimia |
| d. | | Sickle cell |
| | anemia | |
| e. | | Blood poisoning. |
| 14. | Laboratory methods used in investigation of hemolytic anemias. | |
| a. | | Osmotic fragility. |
| b. | | Investigation of |
| | G-6 PD deficiency | |
| c. | | Test for sickling. |
| d. | | Estimation on of |
| | Hb-F, Hb-A ₂ . | |
| e. | | Plasma |
| | haemoglobin and haptoglobin. Demonstration of haemasiderin in urine. | |
| f. | | Hemoglobin |
| g. | | Test for Auto |
| | immune hemolytic anaemias. Measurements of abnormal Hb pigments. | |
| 15. | Origin, formation and fate of blood cells. Theories of blood cell formation. Bone marrow Sites. | |

PRACTICAL:-

- | | | |
|----|---|----------------|
| 1. | Haematology:- | |
| a. | blood collection. | Methods of |
| b. | sahli's method & cyanmethaemoglobin method. | Hb Estimation- |
| c. | | RBC count. |
| d. | RBC, WBC (TLC) and Platelets. | Enumeration of |
| 2. | Preparation of blood smears and staining with leishman stain. | |
| a. | platelet count | WBC count & |
| b. | Differential count (DLC). | WBC - |
| c. | cell volume (Determination of haematocrit) | PCV- Packed |
| d. | Determination. | ESR |
| | I- Westergreen & wintrobe's method. | |
| e. | count. | Reticulocyte |

- f. (prothrombin) time. BT and CT, PT

3. Sickling test. Demonstration.
4. Demonstration of (MP), malaria parasite.
5. Bone marrow smears preparation & staining procedure – Demonstration.

Reference Books. (Latest Edition):-

S.N	Name of books & Title	Author	Publishers Name, place of publication
1.	Text books of harm haematology	Dr. Tejinder singh	Arya publishers
2.	Manual of basic technique for a health laboratory	Dr. Tejinder singh	WHO publishers world health house Indra prasha Estate
3.	Practical haematology	Sir John Dacie	Churchi living stone London
4.	Todd & Sanford clinical diagnosis and management by laboratory methods	John Bernard Henry	All India Traveler books ellar Delhi
5.	Text books of medical laboratory technology	Praful Godkar & Raminc sood	Bhalani publication house Mumbai

BIOCHEMISTRY

1. Introduction to apparatus chemical Balance. Different types principles and practice
2. Concepts of molecular weight, atomic weight normality, molarity. standards, Atomic structure valency, acids, bases, salts & indicators.
3. Concepts of acid base reaction and hydrogen ion concentration. pH meter & pH buffer.
4. Basic cell components:-
 - a. Determination of blood glucose GTT & Insulin tolerance test. Carbohydrate-
 - b. classification and biological importance. Definition,
 - c. Determination of plasma proteins. (Albumin, globulin, fibrinogen). Protein-
 - d. saccharides, oligosaccharides, disaccharides & polysaccharides. Classification and properties. Mono
5. Chemistry of Lipids:-
 - a. Determination of serum cholesterol triglycerides. Lipids-
 - b. Classification and biological Importance. Definition: -
 - c. Triacyly corals and waxes – composition and functions. Simple lipids: -
 - d. lipids- Phospholipids, sphingolipid & glycolipid, composition and functions. Compound
 - e. fatty acids- saturated & unsaturated steroids and their properties. Derived lipids

- | | | |
|-----|--|-----------------|
| f. | body fluids- Sodium potassium, calcium, phosphorus chloride determination & clinical significance. | Electrolytes in |
| 6. | Chemistry of proteins:- | |
| a. | and examples. | Classification |
| b. | classification, properties. Side chains of Amino acid, their properties. | Amino acid – |
| c. | Definition, classification and function. | Protein- |
| d. | Biologically active peptides examples such as GSH, Insulinits structure. | Peptides – |
| 7. | Chemistry of Nucleic acid – DNA structure and function, RNA types, structure and function. | |
| 8. | Non- Protein. Nitrogenous compounds, principles of urea, creatinine and uric acid formation qualitative & quantitative tests. | |
| 9. | Carbohydrates- Metabolism of glucose. | |
| a. | | Glycolysis |
| b. | | Glyconeogenesis |
| s. | | |
| c. | | TCA cycle |
| d. | blood glucose. | Regulation of |
| e. | interpretation. | GTT |
| f. | mellitus. | Diabetes |
| 10. | Vitamins – Definition, classification, source function, deficiency & disorders. | |
| 11. | Flamephotome try and Atomic absorption photometer – principle and use. | |
| 12. | Photometry & spectrophotometry principle & use, Beer- Lambert laws wave lengths, transmittance, absorbance, verifications of beer’s law & its limitation, turbidometry principle & applications. | |
| 13. | Chromatography general account, principle & uses of paper Chromatography. | |

PRACTICAL:-

1. Introduction to apparatus, instruments and uses of chemical balance.
2. Preparation of solutions, calculation of molecular weights and Equivalent weights preparation of normal solution, molar solutions, percent solution and reagents Dilution techniques.
3. Measurements of hydrogen ion concentration qualitative Analysis. Identification of carbohydrates, proteins & substances of biochemical Importance.
4. Demonstration of colorimeter, spectrophotometer, perimeter, single pan balance.
5. Estimation of blood sugar.
6. Test proteins, lipids, carbohydrates.

a.	collection, preservation and preparation of protein – free filtrate.	Sample
b.	of plasma electrophoresis.	Demonstration
c.	NPN substances.	Estimation of
•		Blood urea
•	creatinine.	Serum
•		Serum uric acid.

Text books recommended:-

S.N	Name of books & Title	Author	Publishers Name, place of publication
1.	VARLEY-Clinical chemistry	William heinemann	Medical books Ltd. And inter science books in Newyork
2.	KALPLAN- Clinical chemistry	C.V. Mosoby company	St. Louie's Washington
3.	TEITZ – Clinical chemistry	William B.	Sainders company Harcourt (India)
4.	Biochemistry-	U. Satyanarayan	Books and allied Ltd. Kolkata 700009 (India)
5.	Text books of medical biochemistry	Ramkrishan (S), Rajan(R)	

MICROBIOLOGY

BACTERIOLOGY & PARASITOLOGY:-

BACTERIOLOGY:-

System study of Bacteria:-

1. Gram positive Cocci:
 - a. Staphylococci
 - b. Streptococci.
 - c. Preumococci.
2. Gram Negative Cocci.
 - a. Nesseria.
 - b. Gonococci.
 - c. Meningococci
3. Gram Positive Bacilli.
 - a. Corynebacteria
 - b. Clostridia.
4. Gram Negative Bacilli.
 - a. Enteric bacilli
 - b. Bacteroides.
 - c. Fusobacterium
5. Small gram negative bacilli.
 - a. Haemophilus.
 - b. Boardetella.
 - c. Brucella
 - d. Pasturella
6. Spirochetes- morphology & serological (T. palladium) diagnosis.
Mycobacterium- morphology, classification- identification by biochemical tests.
7. Classification of media, preparation of media for bacteria, culture methods.
8. Sterilization (different method).
9. Management of waste disposal, personal safety quality control.

PRACTICAL:

- Gram stain.
 - Special stain.
- (Zeihl Neelson, Alberts, spore staining.)

- Biochemical and serological test of all organisms listed in systemic Staining culture,
- bacteria and antibiotic sensitivity. study of
- preparation. Hanging drop

Reference books:-

S.N	Name of books & Title	Author
1.	Practical microbiology	Prof. C.B. Baveja
2.	Clinical pathology & bacteriology	Sachdev K.N.
3.	Text books of microbiology	D.R. Area
4.	Text books of medical laboratory technology	Praful Godgar

PARASITOLOGY

HUMAN PARASITOLOGY:-

1. Introduction of parasitology and classification.
2. Protozoa – Classification, morphology lifecycle (diagrammatic) and lab diagnosis.
E. histolytica, Giardia intestinalis, malarial parasite, trichomonas, leishmania, trypanosome, and toxoplasma.
3. Nematodes- Classification, Morphology, life cycle (diagrammatic). & lab diagnosis.
Ascaris, hook worm, whipworm, pinworm, strongyloides, filarial, dracunculus medinensis.
4. Cestodes: - Life cycle & lab diagnosis. Taenia saginata, Taenia solium, echinococcus, Hymenolepis nana.
5. Faeces examination method.
Faeces concentration method.

Practical:-

- examination. Normal faeces
- concentration method. faeces
- examination for E.histolytica. Faeces
- and staining procedures for haemoflagellates, malarial and filarial parasites. Blood smears
- examination for Giardia, trichomonas vaginalis, ascaris, hookworm, whip worm and H. nana ova, Faeces
- Taenia solium, Taenia sagenata ova. Tremethods.

S.N	Name of books & Title	Author
1.	Chattarjee (Parasitology)	Chatterjee K.D.
2.	Medical parasitology	P. Chakraborty
3.	Medical parasitology	Dr. Arora & B. Arora

COMPUTER APPLICATION

Common to all branches of Para – Medical Programmes.

Contents:-

1. Computer Application.

Characteristic of computers.

1.1. Input, output, storage unites.

1.2. CPU, Computer system.

2. Computers Organization.

2.1 Central Processing Unit.

2.1.1 Control Unit.

2.1.2 Arithmetic Unit.

2.1.3 Instruction Set.

2.1.4 Register.

2.1.5 Processor Speed.

2.2 Memory

2.2.1. Main Memory.

2.2.2. Storage Evaluation Criteria.

2.2.3. Memory Organization.

2.2.4. Memory Capacity.

2.2.5. Random Access Memories.

2.2.6. Read Only Memory.

2.2.7. Secondary Storage Devices.

2.2.7.1 Magnetic Disk.

2.2.7.2 Floppy and Hard Disk.

2.2.7.3 Optical Disks CD-ROM.

2.2.7.4 Mass Storages Devices.

2.3 Input Devices.

2.3.1. Keyboard.

2.3.2. Mouse

2.3.3. Trackball

- 2.3.4. Joystick
 - 2.3.5. Scanner.
 - 2.3.6. Optical Mark Reader.
 - 2.3.7. Bar- code reader.
 - 2.3.8. Magnetic ink character reader.
 - 2.3.9. Digitizer.
 - 2.3.10. Card reader.
 - 2.3.11. Voice recognition.
 - 2.3.12. Web cam.
 - 2.3.13. Video Cameras.
- 2.4. Output Devices**
- 2.4.1 Monitors.
 - 2.4.2 Printers.
 - 2.4.2.1 Dot Matrix Printers.
 - 2.4.2.2 Inkjet Printers.
 - 2.4.2.3 Laser Printers.
 - 2.4.3 Plotters.
 - 2.4.4 Computers Output Micro files (Com).
 - 2.4.5 Multimedia Projector.
- 3. Operating System:-**
- 3.1 Microsoft Windows.
 - 3.2.1. An overview of different version of windows.
 - 3.2.2. Basic windows elements.
 - 3.2.3. File managements through windows.
 - 3.2.4. Using essential accessories: system tools Disk cleanup. Disk defragmenter, Entertainment, Games, Calculator. Imaging- Fax, Notepad, paint, WordPad. Recycle bin, windows Explorer, Creating folders, icons.
- 4. Word Processing:-**
- 4.1 Word processing concepts
 - 4.2 Saving, closing, opening an existing document.
 - 4.3 Selecting text, editing text.
 - 4.4 Finding and replacing text.
 - 4.5 Printing documents.
 - 4.6 Creating and printing merged documents, Mail merge.
 - 4.7 Character and paragraph formatting, page design and layout.
 - 4.8 Editing and proofing tools; checking and correcting spelling.
 - 4.9 Handling graphics.
 - 4.10 Creating tables and charts.
 - 4.11 Documents templates and wizards.
- 5. Presentation Package.-**
- 5.1 Creating opening and saving presentations.
 - 5.2 Creating the look of your presentation.
 - 5.3 Working in different views, working with slides.
 - 5.4 Adding and formatting text, formatting paragraphs.
 - 5.5 Checking spelling and correcting typing mistakes.
 - 5.6 Making notes pages and handouts.
 - 5.7 Drawing and working with objects.
 - 5.8 Adding clip art and other pictures.
 - 5.9 Designing slides shows.
 - 5.10 Running and controlling a slide show.
 - 5.11 Printing Presentations.

Reference Books:-

S. N.	Name of books & Title	Author
1.	Foundations of computing first edition,2002	P.K.Sinha and P.Sinha
2.	Microsoft office 2000 for window, second Indian print, pearson education	S. sagman

MLT INSTRUMENT:-

1. Introduction to equipments.

This is a practical oriented laboratory in which the students. Will be given hands on experience of the equipments used in the laboratory. After undergoing the practical, the students will be able to handle the equipments properly and he / she will be able to repair & maintain the equipments used in the laboratory.

2. Simple usage.

3. Indication & contraindication of use.

4. Repair and maintenance of equipments used in laboratory.

5. Microscope digital.

6. Centrifuge (different types).

7. Serological water Bath 37° C

8. Micropipette.

9. Balances (different type).

10. Distilled waterunits.

11. Hot air oven.

12. Autoclave.

13. Sterilization.

14. Water bath. (different types).

15. PH Meter.

16. Incubator.

17. Microtome (different types).

18. Semiauto and fully automatic analyzer.

19. Fully automatic cells counts.

20. Flame photometer.

21. Automatic tissue processor.

22. Automatic cover slipper. Automatic blood weight machine.

23. Freeze, Rotary shaker.

24. Colorimeter.

25. Microscope, monocular, binocular, dark field immersion.

26. Computer:-

Glass ware:-

- ware General Glass
- glass pipette. Different types of
- glass flasks and funnel. Different types of
- maintain of glass ware plastic units. Different types of test tubes. Care and
- dispensers and diluters. Glass capillary. Automatic
- slide racks, glass slides & cover glass. Different types of

Demonstration of all Instruments and glass ware and other Instruments.

Reference books:-

S.N	Name of books & Title	Author
1.	Medical laboratory manual for tropical countries vol. I,II	Monica chedbrough ELBS edition
2.	Medical laboratory technology a procedure manual for routine diagnostic test- vol.- I,II,III	Kandai L. Mukharjee tata me grow hill pub. New Delhi

IInd year

Subject	University Examination	Internal Assessment
1. Safe Injection	100	50
2. Pathology	100	50
3. Entrepreneurship and professional management	100	50
4. Clinical Pathology	100	50
5. Enzymology	100	50
6. Clinical practical training	300	50
7. One month hospital training	100	
Total	900	300

Grand Total - 900+300=1200

SAFE INJECTION

Common to all branches of Para-medical programmes.

1. Registration of participants for model injection centres.
2. Rationale for model injection centre's program.
 - Magnitude of injection
 - Safety of injection.
 - Injection related waste and its disposal.
 - Rational use of injection.
 - What should be done?
 - Model injection centre's specific objectives.
3. Teaching of safe injection
 - What is a safe injection?
 - What is safe injection technique?
 - Steps involved in giving safe injection.
 - A preparing to give injection.
 - Assemble the necessary equipment.
 - Wash hands.
 - Wear gloves.

Drawing up medication:-

- I. Cutting open a glass ampoule.
- II. Drawing medication / vaccine with AD syringe.
- III. Drawing medication from a vial using regular plastic syringe.
 - Recapping needs not recommended.
 - Single handed method for recapping needs.
 - Common routes for giving injection and locating the injection sites.

(1.) Injection Routes:-

- Sites intramuscular injection.
- Sites for intra dermal and subcutaneous injection.
- Sites for intra venous injection.
- Sites for subcutaneous injection.

(2) Preparing the Skin.

Giving the injection:-

- I. Intramuscular
- II. Intra dermal.
- III. Sub cutaneous injection.
- IV. Intravenous.

- (3). Special things to be kept in mind for an Immunization session.
 - (4). Common errors made while giving injection.
 - (5). Assessment of injection practices data an unsafe practices.
 - (6). Errors to be avoided while giving an injection.
4. Handling and disposal of injection related waste.
 - i. Autoclave.
 - ii. Bio medical waste.
 - iii. Incineration.
 - iv. Need stick injury.
 - v. Recycle.
 - vi. Reuse.
 - vii. Terminal disposal of waste.
 5. Handling Injection waste.
 - i. Steps for handing injection waste after giving injection.
 - a. Disposal of injection related wastes at the health facility.
 - b. Steps of disposal injection related waste.
 - ii. Handling of waste containers.
 - a. Terminal disposal of injection related waste color coding and types of container for disposal at bio-medical wastes.
 - b. The central pollution central board and the ministry of health & family welfare on handle of injection related waste at the outreach level / outside district hospital or CHC,s and PHC,s etc.
 - c. The disposal of biomedical waste (BMW) generated within tertiary care hospital/ district hospital / CHC, s / PHC, s etc.
 - d. The containers containing and syringes needs and broken vials to the common. Bio-medical waste treatment facilities.
 6. Setting up at a model injection center.
 - Setting up a model injection center at your health faculty.
 - I. Basic elements of a model injection center.
 - a. Well equipped.
 - b. Safe.
 - c. Efficient.
 - d. Convenient.
 - e. Hygienic.
 - II. Spacing in the injection room.
 - Layout at the model injection center.
 - Adequate supply of injection equipments.
 - List of Essential equipment for a mechanism.
 - Injection tray.
 - Waste disposal mechanism.
 - Emergency kit.
 - Contents of emergency kit.
 - First aid box.
 - Check the Oxygen cylinder daily for proper functioning.
 7. Rational use of injection:-
 - Irrational use of injections.

- Need for rational use of injections.
 - What is irrational use of injection?
 - Are injection were effective and faster acting the oral medication.
 - Common Examples of Irrational use of injections.
 - If oral medication is as effective as injections then why are inject able medications prescribed.
 - Problems in the use of injections.
 - a) When to inject.
 - b) When not to inject.
8. Technique of safe injection.
- What is safe injection (WH.?)

PRACTICAL:-

1. Introduction of injection and types of syringe and Needles.
 - A. Different types of injection.
 - a) Intra muscular injection tech.
 - b) Intra venous injection tech.
 - c) Intra Dermal injection tech.
 - d) Intra sub coetaneous injections tech.
 - e) Canella tech.
2. Demonstration of injection related wastes. And disposal.
 - a) Auto clave.
 - b) Bio medical waste.
 - c) Incineration.
 - d) Needle sticks injury.
3. Hand wash tech.
 - Wear gloves tech.
 - Sterilization tech.
4. Emergency kit contents.
5. First Aid Box contents.
6. Injection related waste at the out rich level / outside district hospital or CHC's and PHS's etc.

PATHOLOGY

HISTOPATHOLOGY:-

1. General principle of Histopathological work collection of specimen, numbering and giving issue list.
Grossing technique.
Various fixatives – mode of action, indication preparation.
2. Equipments used in Histopathology, their merits and demerits and care to be taken.
 - a) Tissue processor
 - b) Microtome
 - c) Knife sharpener
 - d) Automatic slide strainer
 - e) Knives
 - f) Freezing microtone, cryostat
 - g) Hot plate
 - h) Water bath

3. Decalcification – Method, advantages and disadvantages of each method.
4. Frozen section and cryostat techniques, staining and mounting technique, morbid Anatomy.
5. Tissue processing- Fixation, Dehydration, clearing, impregnation in paraffin. Making of paraffin block and section cutting errors in section cutting and their correction.
6. Preparation of different types of Haemaloxytines and Eosin including staining technique for rapid diagnosis. Haematoxylin and Eosin staining (H&E) and mounting.
7. Preparation of different types special stains. Histo-chemical and Cyto-chemical techniques Immune- histochemical and Immune- Cyto chemical staining.
8. Introduction to Electron microscopy and technique of preparing slides. Microphotography technique.
9. Museum technology preservation. Maintenance of records and filling of slides.

CYTOLOGY

1. FNAC (Fine Needle Aspiration Cytology)
2. Malignant Cytology- Technique of collection of various specimens & processing, fixation and staining technique, morphology, and various characteristics of common malignancies in comparison with normal.
3. Cyto-chemistry – Staining technique for glycogen, Fat, Mucin etc.
4. Cell morphology and physiology, cytoplasm of the resting cell, mitosis of resting cell mitosis and its mechanism, correlation to cell structure and function.
5. Automation in cytology cytosine -2.
6. Papanicolaon method (PAP).
7. Hormone cytology :-
 - Anatomy structure and physiology of female genital tract.
 - Correlation of structure of female genital tract & ovarian hormones.
 - Various cytological findings.
8. Malignant cytology:-
 - Cervical malignant.
 - Classification of cervical smear and characteristics of normal inflammatory and dysplasia (mild, moderate, severe) Ca-in- situ, Squamous Cell carcinoma and adenocarcinoma of endocervix.
 - Characterization of radiation changes in cells.
 - Endometrial malignancy, cytology of normal hyperplasia and adenocarcinoma.
 - Cytological screening of cervical cancer.
 - Miscellaneous – ovarian carcinoma, etc.
9. Urinary Tract:-
 - Anatomy, histology and physiology of the urine system.
 - Collection, preparation of samples.
 - Cytology of normal, non- malignant and malignant tissues of urinary tract.
10. Respiratory Tract:-
 - Anatomy, Histology, physiology and normal cytology of the respiratory tract.
 - Collection, selection of material and making smear.
 - Cytology of various types of Bronchogenic carcinoma.

HAEMATOLOGY

1. Investigation of bleeding disorders:-
 - a. Collection and anticoagulation used in coagulation studies.
 - b. Bleeding time (BT), clotting time (CT) methods and interpretation.
 - c. Other coagulation studies, PT, KPTT, TGT, etc. clot retraction time.
 - d. Test for blood fibrinolytic activity and election of F.D.P.
 - e. Platelet function test demonstration of L.E. cells.
 - f. Automatic in Hematology.
 - g. Organization and quality control in hematology laboratory.

PRACTICAL:-

A. Histopathology and Cytology :-

1. H & E staining technique.
2. Special stain used in histopathology.
3. Cells block preparation.
4. Tissue blocks cutting technique.
5. PAP staining technique.

B. Haematology :-

1. Bleeding time, clotting time.
2. L.E. cell demonstration.
3. M.P.O. & Sudan black – demonstration.
4. PT, APTT, FDP.

Reference Books:-

S. N.	Name of books & Title	Author
1.	Text book of medical laboratory technology	Praful Godgar
2.	Theory & practical of histological techniques	John D. Bancroft Etal
3.	Histochemistry in pathology	M.I. Filipe Etal
4.	Practical pathology	P.Chakraborty, Gargi Vhkraborty

ENTREPRENURSHIP AND PROFESSIONAL MANAGEMENT:-

Common to All Branches of Para-medical Programmers

RATIONAL:-

As the opportunities for wage employment are reducing day by day, Govt. of India and State Govt. directed to develop entrepreneurship among the students. Entrepreneurship training is essential to make aware the students of different branches of diploma courses about the scope of employment outside the Govt. Sector. It will equip them the necessary skills and training for setting up a small scale enterprise in their own area of study. This course includes the procedure how to select, proceed and start the small scale enterprises. To achieve the target and goals in an organization, it is essential to ordinate the entire system. For this, the knowledge of principles of management, personnel management and financial management is required.

CONTENTS:-

1. Entrepreneurship :-

- a. Definition, basic concept, need, scope and characteristics of entrepreneurship.
- b. Woman entrepreneurship.
- c. Assistance to small scale from enterprises national level organizations like SIDO, NSIC, NRDC, KVIC.
- d. Assistance to small scale enterprises from State level organizations like DOL, DIG, RFC, SISI, RHDC, Pollution Control Board, Rajasthan khadi & Village Industries Board , banks etc.
- e. Facilities to women entrepreneurs.

2. Emerging Areas in Entrepreneurship :-

- a. Innovation & Creativity.
- b. Introduction to Intellectual Property Rights (IPRs) & Patents.
- c. National Knowledge Commission: basic concept need & scope.
- d. Service sector: scope future trends.
- e. Energy & Auditing.

3. Project formulation process:-

- a. Steps in planning a small scale enterprise.
- b. Structure of project report.
- c. Analysis of sample , project reports
- d. Preparation of project reports.
- e. Techno-economic & feasibility of the project.

4. Financial sources for SSI Loan:-

- a. State Govt. RFC, Credit facility by banks.

5. Rules & Regulations :-

- a. Licensing & registration procedure.
- b. Important provisions of Factory Act.

- c. Shop & Commercial Establishment Act.
- d. Sales of Goods Act.
- e. Partnership Act.
- f. Value Added tax (VAT).
- g. Service tax.
- h. Professional tax.
- i. Income tax.
- j. Sales tax & excise rules.
- k. Municipal bye laws & insurance coverage.

6. Meaning and Scope of Business:-

- a. Definition of profession, trade and Industry.
- b. Objective of business and profession
- c. Types of business organization.
- d. Brief description, advantage disadvantage of individual – partnership – cooperative private and public limited organizations.
- e. Characteristics of small business, business ethics, organization chars.

7. Management Techniques:-

- a. Leadership, authority, responsibility.
- b. Functions of Management.

8. Quality Control:-

- a. Meaning, importance of keeping standard.
- b. Factor responsible for deviation from standards.
- c. ISO and ISO-9000 to 9006,
- d. Total quality management.

9. Financial Management:-

- a. Sources of finance.
- b. Brief idea of cash and credit, Cheques, draft, bill of exchanges, promissory note.

10. Marketing :-

- a. Basic concept,
- b. Market promotion, market promotion.
- c. Branding, packaging, planning and development.
- d. Advertisement media and effectiveness.
- e. Sales forecasting, marketing mix – pricing policy, sales promotion and salesmanship.
- f. After sales services, complaints and their redressal.

11. Human Relations:-

- a. Motivating the employees,
- b. Inter personnel relations ,
- c. Grievances and their handing.
- d. Staff requirement, training and monitoring.

12. Foreign Trade:-

- a. Export procedure.
- b. Channels of distribution in expert trade.
- c. Export Promotion.
- d. Registration of firm/ factory in R.B.I., AEPC or others.

Note: - Entrepreneurial awareness camp should be arranged for 3 to 4 day at a stretch. No. question will be asked in the examination from the topics under Entrepreneurship awareness camp.

Entrepreneurial Awareness Camp:

Topics to be covered in the camp:-

- 1) Who is an entrepreneur
- 2) Need for entrepreneurship, entrepreneurial career and wage employment.
- 3) Scenario of development of small scale enterprises in India.
- 4) Entrepreneurial history in India, Indian values and entrepreneurship.
- 5) Assistance from District Industries Center. Commercial banks. State financial Corporation. Small Industries service Institutes. Research and development laboratories & other financial and development corporations.
- 6) Considerations for product selection.
- 7) Opportunities for business, service & entrepreneurship ventures.
- 8) Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs should be arranged).

The camp can be arranged by the institution itself **with the help of other agencies such as RICO, DIC, Science & Technology Department, Rajcon, Deptt. Of Industries, SISI, E.D. Cells etc.**

Reference books

S. N.	Name of books & Title	Author
1.	Hand book of small scale Industry	P.M. Bhandari
2.	Hand book of entrepreneurship development	O.P. Harkut
3.	Entrepreneurship development	S.S. Khanka
4.	Statistical quality control	Manohar Mahajan
5.	ISO : 9000 quality system - 2000	S. Dalela
6.	ISO : 14000	
7.	Organization & Management of small scale industries	Desai J.V. Himalaya, Bombay 1985
8.	Management of small scale industries	3 rd Himalaya, Bomaby, 1986
9.	The story of an entrepreneurship	M. Nath, IMT Monograph
10.	Small industry entrepreneurs hand book Mohan international	K.R. Bombay productivity services
11.	Hand book of entrepreneurship	Rao & pareek, New Delhi learning system 1978

CLINICAL PATHOLOGY

1. Urine Analysis :-

- a. Composition of Normal Urine.
- b. Collection of Urine Specimen.
- c. Routine Urine Analysis:-
 - Physical Examination.
 - Chemical Examination.
 - Microscopic Examination.
- d. Principle of test for- Glucose, Protein, Bile salt, Bile pigment, urobilinogen, occult blood.

2. Body Fluids :-

- a. C. S. F. () and other body fluids examination.
- b. Composition of Normal C.S.F.
- c. Collection & processing of specimens.
- d. Routine C.S.F. Analysis:-
 - Physical examination.
 - Chemical examination.
 - Microscopic examination.

3. Semen Analysis :-

- a. Composition of Semen.
- b. Collection of semen.
- c. Routine semen Analysis:-

Physical examination, Chemical examination, Microscopic examination.

4. Sputum Analysis:-

- a. Method & Presentation in collection of sputum.
- b. Physical, Chemical and microbiological examination.
- c. Concentration method for A. F. B.

5. Blood :-

- a. RBC count, WBC, Platelets, Eosinophile and Reticulocyte count.
- b. Hemoglobin estimation with different methods, Hb electrophoresis.
- c. Determination of P.C.V., ESR and Red indices. L.E. cell test, sick ling test, osmotic fragility test, foetal hemoglobin estimation, GCPD estimation.
- d. Preparation and staining of peripheral blood smear and bone marrow smear.
- e. Different leukocyte count, Demonstration of material parasite.

6. Stool Analysis:-

- a. Composition of normal stool.
- b. Collection of stool specimen.
- c. Routine stool examination: - Physical, chemical, microscope examination.
- d. Stool concentration method.

PRACTICAL:-

1. Urine Routine examination.
2. C.S.F. and other body fluid examination.
3. Semen Analysis.
4. Sputum test.

5. Different types blood test.
6. Stool routine examination.

	Reference Books.	Author
1.	Text books of laboratory technology	Praful Godkar
2.	Todd & Sanford Clinical diagnosis & management By laboratory methods	Johan Bernard Henry
3.	Practical Pathology	P. Chakraborty, Gargi Chakraborty
4.	Medical laboratory technology a procedure normal For Routine	Kanai L. Mukharjee

ENZYMES AND HORMONES

THEORY:-

UNIT – I

Enzymes and their characteristics – Enzyme specificity with suitable examples. Classification of enzymes. Coenzymes, cofactors and activators factors affecting enzyme activity. Km and its significance.

UNIT – II

Enzyme interdiction. Various types of enzyme interdictors namely competitive, non competitive, uncompetitive and mixed inhibitors and their uses in drug therapy. Study of enzymatic reactions commonly employed in clinical laboratories.

UNIT – III

Iso enzymes. Allosteric enzymes. Intra cattalo's distribution of enzymes in relation to Metabolic pathways. Enzymes in clinical diagnosis.

UNIT – IV

Hormones and their mode of action – Peptides steroids, amino and derivatives and fatty and derivatives acting as hormones. Hormones recreated by pituitary, thyroid, pancreas and adrenal glands. Techniques employed in hormones assay.

UNIT – V

Radio isotopic commonly used in medical sciences. Application of radio isotopes. Monitoring of radioactivity by use of Scintillation counters radio immune assay. Handling and hazards of radiation envied by radio isotopes.

PRACTICAL:-

1. Serum alkaline and Jhospha fase assays.
2. Assay of serum transaminases.
3. Assay of serum any lose.
4. Assay of creative kinas'.
5. Estimation of T₃ and T₄ hormones.
6. Determination of alpha fetoprotein.
7. Glycated hemoglobin (Hb A, C) assay.
8. Others important analytes in various body fluids.

Recommended Books:-

	Name of books	Author
1.	Text book of Biochemistry for medical students	DM Vasuderam and Sree kumaris
2.	A text book of Biochemistry for dental students	Harbans lal
3.	Harper,s Review of Biochemistry	Marten, Majes, Rodwell, Granner

III rd Year

Subject	University Exam.	Internal Assessment
1. Ad Biochemistry II	100	50
2. Blood Banking	100	50
3. Virology, Immunology	100	50
4. Environmental studies.	100	50
5. Statistics	100	50
6. Clinical practical training	300	50
7. One month hospital training	100	
Total	900	300

Grand Total - $900+300=1200$

BIO CHEMISTRY

Theory:-

UNIT-I

Cell components and their functions cell fractionation and separation of cellular components structure, bio chemical functions and marker enzymes of cell membranes, nucleons, me to chundria, enoloplasmic reticulum, Golgi apparatus, ribosome, liposome's and cytoplasm . Concept of pH and its measurement. Indicators, solutions and Physiological buffers.

UNIT-II

Carbohydrates chemistry, classification and biological functions. Mono Saccharides, disaccharides, oligosaccharides and polysaccharides. Muccopaly saccharides and their functions. Dextrin and dextrin Monosaccharide derivatives. Dietary carbohydrates and their utilization . Metabolic pathways of carbohydrate metabolism.

UNIT-III

Lipids chemistry, classification and biological Significance. Triglycerides, oils and fats. Phosthoirions, glylolipids and spingolipids in relation to functions and structure Phospholifases Derived lipids . Saturated and unsaturated Getty acids important properties of gala and oils. Prostaglandins Steroids and their properties Dietary gats and their utilization.

UNIT-IV

Proteins chemistry and their classification Biological functions of proteins and peptides structure, classification and important properties of amino acids. Primary, secondary tertiary and quaternary structures of proteins Dietary proteins and its utilization . Protein quality, essential nonessential and semi essential amino acids Conformation, denaturation and electrophoresis reparation of tissue proteins. Brief description of enzymes Non protein nitrogenous substances. Protein separation techniques in brief .

UNIT-V

Nucleic acids and their chemistry functions of DNA and RNA. Different types of RNA, S at cellular level with structures and functions central dogma of life. Generalized features of genetic coole. Brief description of replication, transcription and translation. Metabolic roles of vitamins and minerals . Dietary sources, functions and disorders.

PRACTICALS:-

1. Introduction to commonly used apparatus, chemical and electronic balances in the laboratory.
2. Preparation of standard solution using normality, morality and modality concepts .
3. Maintenance of various types of glassware and apparatus in the laboratory.
4. Use of pH meter and recording Ph of water, urine, serum, milk and fruit juices.
5. Simple acid base filtrations.
6. Colour reactions of carbohydrates, lipids and proteins and bimolecular of medical importance.
7. Demonstration working of pH meter, analytical balance, pH meter, colorimeter, pH meter etc.
8. Estimation of capillary blood glucose level by use of glucometer.

Recommended Book:-

S.N.	Reference books	Author
1.	Biochemistry – question and answers	U. Sitaram Acharya
2.	Biochemistry	U. Satayanaran
3.	Practical biochemistry	Sheel Sharma

4.	Clinical chemistry	M.N. Chatterjee
5.	A text book of medical biochemistry	S. Ramakrishan and R. Ranjan

BLOOD BANKING

1. **Introduction**
 - A. Blood Group System
 - B. Blood Group Incompatibility, ABO, RH & Systems
 - C. Cross Matching Test in emergency
2. **Blood Bank Preparation**
 - A. Blood collection procedure, care & donor selection registration, medical history, physical examination
 - B. Transport and storage
 - C. Screening and selection of donor
 - D. Preparation and use of whole blood and blood components washed red cells
 - E. Plasma preparation etc.
3. **Blood Grouping- ABO, RH and others systems of blood groups, sub group of A, Bombay group. Antibodies to ABO system & Anti AB and Anti D Antibody**
 - A. ABO Testing slides and tube test
 - B. Reverse grouping discrepancies, between cell & serum results sources of error
 - C. RH grouping test and slide
 - D. Rapid tube test false positive and false negative results
 - E. Du test system & its significance
4. **Cross Matching**
 - A. Reasons of cross match
 - a) Saline
 - b) Albumin
 - B. Coombs and enzymes in testing
5. **Rolex formation and methods of checking this**
 - A. Comb's test – Direct and Indirect, principle, explanation of procedure & sources of error, control interpretation and clinical application
 - B. Demonstration of comb's test direct & indirect
6. **Labeling of Tubes, methodology legal implication in computable cross**
 - A. Auto antibodies, plasma expanders, multiple myeloma etc. Affecting a cross match
 - B. Difficulties in cross match and methods of investigations.
7. **Quality control in blood banks**
 - A. Specimen collection
 - B. Risk assessment for AIDS and serum hepatitis

PRACTICAL:-

1. **Blood Bank Administration**
 - a) Record Keeping
 - b) Computerization in blood transfusion services
 - c) Blood grouping ABO
 - d) Ph typing various techniques
2. **Cross Matching**
 - a) Tube Test
 - b) Slide Test
 - c) D^u Test
 - d) Sub Grouping Test
3. **Coomb's Test**
 - a) Direct coomb's test
 - b) Indirect coomb's test
4. **Compatibility Testing for blood transfusion cross matching test**
 - a) 5% cell suspension & 10% cell suspensions
 - b) HIV & AIDS demonstration

Recommended text books & reference books (Latest Edition)

S.N.	Name Of Book & Title	Author	Publisher Name
1	Hand book of Blood Transfusion Therapy	J.A.F.Napier	John Wiley & sons Chichester ,England
2	Blood Banking & Transfusion Medicine Basic Principles practice	Christopher D.,Hill Yeretal	Churchile Livingstone, Philedelphia
3	Text book of Blood Transfusion Banking & Transfusion Medicine	Sallyv. Rhdman	W.B.Saunders company , Philedelphia
4	Practical Haematology	Sir John Dalie	Churevill , London
5	Text Book of Medical Laboratory Technology	Praful Godkar & Ramink Sood	Bhaliani Publication House, Mumbai

IMMUNOLOGY

1. **Antigen antibody reaction- Principles and Practical application of various types of Serological test:-**
 - Precipitation
 - Agglutination
 - Complement fixation test
 - Neutralization
 - ELISA, Radio immune assay
 - Electrophoreses
 - Immuno fluorescence
 - Polymerase chain
2.
 - Hyper Sensitivity- definition & type only
 - Antoimmunity
 - Transplantation and bunion immunity

PRACTICAL:-

- Serological Reactions (UDRL, WIDAL, RA, ELISA)
- Precipitation
- Agglutination
- Compliment fixation test
- Immuno fluorescence
- ASO, Paul Bunnell and other tests.

VIROLOGY**1.****Introduction**

- General Characters with classification
- Laboratory diagnosis of viral infection
- Viruses and diseases, (Anbovirus, Entrouirus, Herpes virus, Myxovirus, Pox adenovirus), (Human Immune deficiency virus), (Hepatitis Viruses)
- Immunity in Viral infection and Antiviral Chemotherapy
- Viral Vaccines
- Bacteriophage
- Tissue Culture

2.**Equipments**

- Equipments for carrying out tissue culture studies
- Microscope
- Laminar flow equipment
- Carbon dioxide incubator

3.**Sterilization**

- Dry heat sterilization
- Autoclaving (Atmosphere of Steam)
- Chemical Sterilization
- Filter Sterilization of liquid media

4.**Derivation of culture from the tissue**

- Planting of cells in tissue culture media
- Enzymatic digestion of the tissue using collagens protease
- Observation of cells in invert scope
- Sub culturing and derivation of cell lines

5.**Characterization of cell lines**

- Determination of biochemical markers in cells lines
- Immunological Properties of cells
- Chromosomal an DNA content of cells

6.**Preservation**

- Storage in glycerol in liquid nitrogen
- Storage in Dimethyl Sulfoxide in liquid nitrogen

PRACTICAL:-

- Viral Serology / P.C.R
- Techniques in tissue culture
- Haemagglutination in habitation test



Demonstration of Cytopathogenic effect Haemagglutination Test.

MYCOLOGY

1.

Introduction

- a) Fungi Introduction
- b) Actionmycetes
- c) Yeasts and yeast like Fungi
- d) Dermatophytes
- e) Fungi of Deep Mycoses

PRACTICAL:-

- KOH Preparation
- Morphology of Fungi
- Lacto phenol blue Staining
- Yeasts
- Dimorphic Fungi
- Dermatophytes
- Culture demonstration of Contaminants – Aspergillus, Penicillium, Mucor, Rhizopus.

Sr.No.	Reference Book	Author
1	Emmons, Medical Mycology	W.B.Saunders
2	Text Book of Microbiology	Prof. C.P.Baveja
3	Clinical Pathology & Bacteriology	Sachdev K.N.

ENVIRONMENTAL STUDIES

Common to All Branches of Para-Medical Programmes

RATIONALE

Environmental study is a subject as per directions of Supreme Court / Govt. of India. Under Act. 51A (g) of our constitution it is our fundamental duty to protect our environment.

A diploma holder must have knowledge of different types of pollution and health hazards so that he/she may help in balancing the eco system and controlling pollution by pollution control measures. He/She should also be aware of environmental laws related to the control of pollution in general and bio-medical waste in particular.

1.
 - (A) **General :**
 - a) Biotic and abiotic environment
 - b) Adverse effects of Environmental Pollution
 - c) Control strategies
 - d) Various Acts and Regulations
 - (B) **Water Pollution:**
 - a) Water Quality Standards for potable water
 - b) Surface and underground water sources
 - c) Impurities in water and their removal
 - d) Defluoridation
 - e) Adverse effects of domestic waste water and industrial effluent to surface water sources
 - f) Eutrophication of lakes
 - g) Self purification of streams
 - (C) **Air pollution:**
 - a) Sources of air contaminants
 - b) Adverse effects on human health
 - c) Measurement of air quality standards and their permissible limits
 - d) Measures to check air pollution
 - e) Greenhouse effect
 - f) Acid rain
 - g) Ozone depletion
2.
 - (A) **Bio Medical Waste Management**
 - a) Introduction to Bio-medical waste
 - b) Types of bio-medical waste
 - c) Collection of bio-medical waste
 - d) Treatment and safe disposal of bio-medical waste
 - (B) **Solid Waste Management**
 - a) Introduction to solid waste
 - b) Its collection and disposal

- c) Recovery of resources
 d) Sanitary land-filling
 e) Vermin-composting
 f) Hazardous waste management
3. (A) **Land Pollution**
 a) Soil conservation
 b) Land erosion
 c) Afforestation
- (B) **Ecology**
 a) Busies of species
 b) Biodiversity
 c) Population dynamics
 d) Energy flow
 e) Ecosystems
4. (A) **Social Issues and the Environment**
 a) Sustainable development and Life style
 b) Urban problems related to energy
 c) Resettlement and rehabilitating of people
 d) Environmental ethics
 e) Consumerism and waste products
- (B) **Water Harvesting and Rural Sanitation**
 a) Water harvesting techniques
 b) Different schemes of Rural Water Supply in Rajasthan
 c) Rural Sanitation
 d) Septic Tank
 e) Collection and disposal of wastes
 f) Bio-gas
 g) Community Awareness and participation
5. (A) **Miscellaneous**
 a) Non-Conventional (Renewable) sources of energy
 b) Solar energy, Wind energy, Bio-mass energy, Hydrogen energy

PRACTICAL:

1. Visit to local air polluted site
2. Visit to local water polluted site
3. Visit to local area to document environmental assets-
mountain/desert/river/forest
4. Study of local birds, plants, insects
5. Plantation work
6. Environmental awareness campaign through exhibitions

After visits/study, the students will prepare posters, charts, reports.

Reference Books:-

Sr.No.	Reference Book	Author
1	Paryavaran Shiksha,	Dr. A.N.Mathur, Dr. N.S.Rathore, Dr. V.K.Vijay
2	Paryavaran Adhyayan	Dr. Ram Kumar Gujar, Dr. B.C.Jat
3	Parayavaran Avabodh	Dr. D.D.Ojha
4	Environmental Chemistry & pollution control	S.S.Dora
5	Ecology concepts and application	Manuel C.Muller
6	Environmental Protection	Emil T. Chanlett
7	Environmental Science	Cumingham Saigo
8	Solid waste management	C.I.Mantell
9	Introduction to Environmental Engineering & Science	Gilbert M Masters prentice hall of india 1995
10	Concept of Ecology, 1991	Edward J kormondy
11	Ecology 1975	Odum
12	Environmental Engineering	Peavy, Rowe, Tehobaniglum
13	Environmental Impact Assessment	Mc Graw Hill, New York, 1977
14	Environmental Technologies for Sustainable Development	Dr. Upendra Pandel Dr. M.P.Poonia
15	Environmental Pollution & Management	V.K. Kohli & Vikas Kohli
16	Panda, New letter	WWF. India, New Delhi

Recommended faculty for teaching the subject: Faculty of Civil engineering or M.Sc. in Environment or PG Diploma in Environment and Sustainable Development.

BIostatISTICS

1. Introduction

Application and uses of Biostatistics as a science as figures, scope, common statistical terms Nations.

2. Review of Literature, Study Design, Sample Size, Sampling Variability & Significance protocol writing Ethnical Aspects.

3. Sources and Presentation of Data.

Data collection Analysis, Interpretation and presentation. Common statistical Terms measures of Location, Average & Percentiles.

4. Use of Micro Computer in Research Professional arrangement ethics, administration, budget and development of organization.

5. Life Table

Uses and Application Construction of Life Table, modified Life Table.

Sampling

Representative Sample, precision (sample size) sample bias, sampling Techniques.

Simple Random Sampling

Systematic, Stratified, Multistage, Cluster, Multiphase

Text Books:-

S.N	Name Of Book & Title	Publisher Name
1	B.K. Mahajan	Jaypee brothers Medical publishers P. Ltd. B-3 Emca house 22/23 B , Ansari road duryangbaj post box 7193 New Delhi 110002
2	THEODORE COLTON	Dartmouth medical school hanover, New hampshire