



SunRise University

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Recognized by UGC Act, 1956 u/s 2 (f)

SRU COLLEGE OF PARAMEDICAL TECHNOLOGY SunRise University Campus , Alwar , Rajasthan , India

SYLLABUS

B.Sc. NEUROSCIENCE TECHNOLOGY
Under Graduate Paramedical Technician Degree Course

Syllabus

Curriculum

MISSION

To promote sustainable development of higher education consistent with statutory and regulatory requirements. To plan continuously provide necessary infrastructure, learning resources required for quality education and innovations. To stimulate to extend the frontiers of knowledge, through faculty development and continuing education programs. To make research a significant activity involving staff, students and society. To promote industry / organization, interaction/collaborations with regional/national/international bodies. To establish healthy systems for communication among all stakeholders for vision oriented growth. To fulfill the national obligation through rural health missions.

OBJECTIVES

To implement effectively the programs through creativity and innovation in teaching, learning and evaluation. To make existing programs more careers oriented through effective system of review and redesign of curriculum. To impart spirit of enquiry and scientific temperament among students through research oriented activities. To enhance reading and learning capabilities among faculty and students and inculcate sense of life long learning. To promulgate process for effective, continuous, objective oriented student performance evaluation. To ordinate periodic performance evaluation of the faculty. To incorporate themes to build values, Civic responsibilities & sense of national integrity. To ensure that the academic, career and personal counseling are in-built into the system of curriculum delivery. To strengthen, develop and implement staff and student welfare programs. To adopt and implement principles of participation, transparency and accountability in governance of academic and administrative activities. To constantly display sensitivity and respond to changing educational, social, and community demands. To promote public-private partnership

PREAMBLE

The B.Sc. Neuroscience Technology Course is of 3 years degree course aimed at training the students in the technological aspects of medical care with a good scientific foundation. These students will be in a position to competently assist the Neurologist, especially in high tech Neurological procedures. They will be in demand both within the country and outside as Allied Healthcare personnel. With advanced training in the latest technologies in Neurology specialty, these graduates will play an important role in determining the quality of health care provided. I.

TITLE OF THE COURSE The course shall be called Bachelor of Science in Neuroscience Technology. II.

ELIGIBILITY FOR ADMISSION

A candidate seeking admission to the Bachelor of Science Neuroscience Technology Course shall have passed 12th PHYSICS,CHEMISTRY , BIOLOGY from a government recognised Board / Council / University or its equivalent.

III. DURATION OF COURSE

The duration of the Course shall be for period of three years

IV. MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

V. SCHEME OF EXAMINATION

There shall be six examinations during the course, each at the end of the first, second, third, fourth, fifth and sixth semester.

VI. ATTENDANCE

Every candidate shall attend at least 80% of the total number of classes conducted in a calendar year from date of commencement of the term to the last working day as notified by the University in each of the subjects prescribed for that year separately in Theory and Practical. Only such candidates are eligible to appear for the University examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A Candidate lacking in prescribed percentage of attendance in any one or more subjects either in Theory or Practical in the first appearance will not be eligible to appear the University Examination either in one or more subjects.

Scheme of Examination:

FIRST SEMESTER

PAPER CODE	SUBJECT	INTERNAL	EXTERNAL	TOTAL
THEORETICAL				
1BSCNST01	Human Anatomy I	40	60	100
1BSCNST02	General Physiology I	40	60	100
1BSCNST03	Basic Biochemistry I	40	60	100
1BSCNST04	Basic Pathology & Haematology I	40	60	100
1BSCNST05	Microbiology I	40	60	100
PRACTICAL				
1BSCNST06	LAB PRACTICALS I	40	60	100

SECOND SEMESTER

PAPER CODE	SUBJECT	INTERNAL	EXTERNAL	TOTAL
THEORETICAL				
2BSCNST01	Human Anatomy II	40	60	100
2BSCNST02	General Physiology II	40	60	100
2BSCNST03	Basic Biochemistry II	40	60	100
2BSCNST04	Basic Pathology & Haematology II	40	60	100
2BSCNST05	Microbiology II	40	60	100
PRACTICAL				
2BSCNST06	LAB PRACTICALS II	40	60	100

THIRD SEMESTER

PAPER CODE	SUBJECT	INTERNAL	EXTERNAL	TOTAL
THEORETICAL				
3BSCNST01	Basic Neurosciences I	40	60	100
3BSCNST02	Basic Neurophysiology And Electro Encephalography	40	60	100
3BSCNST03	Basic Nerve Conditions ,Electro Myography & Evoked Potentials	40	60	100
3BSCNST04	Biowaste Management & Infection Control	40	60	100
3BSCNST05	English	40	60	100
PRACTICAL				
3BSCNST06	LAB PRACTICALS III	40	60	100

FOURTH SEMESTER

PAPER CODE	SUBJECT	INTERNAL	EXTERNAL	TOTAL
THEORETICAL				
4BSCNST01	Basic Neurosciences II	40	60	100
4BSCNST02	Applied Electro Encephalography	40	60	100
4BSCNST03	Indian Constitutional Law	40	60	100
4BSCNST04	General & Clinical Hygiene	40	60	100
4BSCNST05	Environmental Studies	40	60	100
PRACTICAL				
4BSCNST06	LAB PRACTICALS IV	40	60	100

FIFTH SEMESTER

PAPER CODE	SUBJECT	INTERNAL	EXTERNAL	TOTAL
THEORETICAL				
5BSCNST01	Basic Neurosciences III	40	60	100
5BSCNST02	Applied Nerve Conditions, Electromyography, Evoked Potentials	40	60	100
5BSCNST03	Fundamentals of Computer Science	40	60	100
5BSCNST04	Basic Psychology & Patientcare	40	60	100
PRACTICAL				
5BSCNST05	LAB PRACTICALS V	40	60	100

SIXTH SEMESTER

PAPER CODE	SUBJECT	INTERNAL	EXTERNAL	TOTAL
THEORETICAL				
6BSCNST01	PAPER I (Professional Training 6 Month Duration)	40	60	100
6BSCNST02	PAPER II (Internal Assessment / Practical / Project File / Practical Performance)	40	60	100
6BSCNST03	PAPER III Electives	40	60	100
6BSCNST04	Basic Psychology & Patientcare	40	60	100
PRACTICAL				
6BSCNST05	LAB PRACTICALS VI	40	60	100

Semester I

PAPER I :

Human Anatomy

Theory 25 Hours

The human body as a whole:

Definitions, Subdivisions of Anatomy, Terms of location and position, Fundamental Planes, Vertebrate structure of man, Organization of the Body cells and Tissues.

Locomotion and support:

The Skeletal system:

Types of bones, structure and growth of bones, Divisions of the skeleton, Appendicular skeleton, Axial skeleton, name of all the bones and their parts, joint- classification, types of movements with examples. Anatomy of the Nervous System: Central nervous system: Brain and Spinal cord, functions, meninges.

The Brain

Brief structure of Hind Brain, Midbrain and Forebrain, Location, gross features, parts, functional areas, cerebral blood circulation and coverings, Functions of peripheral nervous system, Organization and Structure of Typical Spinal Nerve Spinal Cord: Gross features, extent, blood supply and coverings, reflex- arc.

Applied Anatomy of spinal cord and brain.

Anatomy of circulatory system: Heart: Size, location, external features, chambers, pericardium and valves, Blood supply and Nerve supply.

Right and Left Atrium:

Structural features, venous area, septum and appendages, structural features inflow and outflow characteristics.

The study of blood vessels, General plan of circulation, pulmonary and systemic circulation.

Names of arteries and veins and their positions, general plan of lymphatic system.

Coronary Circulation, Lymphatic drainage of heart in brief Applied aspects of heart and pericardium.

Anatomy of the Respiratory system:

Organization of Respiratory System, Gross structure and interior of Nose, Nasal cavity, Para nasal air sinuses, Gross structure and interior of Pharynx, Larynx, trachea, bronchial tree, Pleura Gross structure and Histology of Lungs, Pulmonary Circulation, Pulmonary Arteries, Pulmonary Veins and Bronchial Arteries.

Nerve Supply of Respiratory System and Applied aspect of Respiratory System.

Anatomy Practical 20 Hours

1. General Histology Slides: „ Epithelial Tissue, „ Connective Tissue, „ Hyaline Cartilage, „ Fibro Cartilage, „ Elastic Cartilage, „ T.S. & L.S. of Bone, „ Blood Vessels, „ Tonsil, „ Spleen, „ Thymus, „ Lymph node, „ Skeletal and Cardiac Muscle „ Peripheral Nerve and Optic Nerve
2. Systemic Histology Slides: „ RS -Lungs and Trachea „ Cerebrum
3. Demonstration of all bones - Showing parts, joints,
4. X-rays of all normal bones and joints.

5. Demonstration of heart and normal angiograms.
6. Demonstration of Brain
7. Demonstration of different parts of respiratory system and normal X-rays

Scheme of Exam for Practicals:

Practical

Histology

Spotters

Gross Anatomy Discussion

IA Marks

Semester I

PAPER 2 :

Section A –

General Physiology

Theory 35 Hours

General Physiology:

Structure of Cell membrane and Cell Organelles, Intercellular junctions, Classification of Body fluid compartments & composition, Homeostasis, Transport across cell membrane

Definition and Classification Nerve Muscle

Physiology:

Definition of Resting Membrane Potential, Action Potential

Phases & ionic basis, Classification and structure of Nervous Tissue, Structure, Classification and Properties of Skeletal Muscle, Neuromuscular Junction

Definition, Structure and Mechanism of neuromuscular transmission, Myasthenia gravis, Excitation Contraction Coupling. Blood:

Composition and functions of blood and plasma proteins Red Blood Cells: Morphology & functions, Erythropoiesis, types & functions of hemoglobin, Definition and Classification of Anemia & Jaundice. White blood cells: Morphology, functions Definition of Leucopoiesis,

Immunity - definition, and classification, Platelets and Blood Coagulation: Morphology & functions of platelets, Mechanism of Hemostasis, Anticoagulants, Bleeding disorders. Blood Groups: Classification of Blood Groups, ABO and Rh blood group systems, uses of blood grouping test and Cross matching, Blood Transfusion and its hazards. Central Nervous System: Organization of CNS: Introduction, Structure of neuron,

Properties of nerve fiber, Axonal Transport, Classification of nerve fibers. Synapse, Receptor & Reflex: Definition of synapse, receptor &

reflex, Classification of Synapse, Structure & properties of synapse, Classification of receptor, adaptation, properties of receptor, Components of reflex arc, classification of reflex. The sensory system: Overview of sensory system, Structure of Spinal Cord, Ascending tracts - Anterior Column, Lateral Column and Posterior Column Tract - Course, termination and function The motor system : Overview of motor system, cortical motor areas, pyramidal and extra pyramidal, tract- Course, termination and function, Upper & Lower Motor Neuron, Lumbar Puncture. Functions of Various parts of Brain:Cerebellum, Basal ganglia, Hypothalamus, Thalamus, Autonomic Nervous System Temperature Regulation: Normal temperature of body, Regulation of body temperature & Fever Special Senses: Vision: Structure of Eye, Functions of rods and cones, accommodation, visual pathway, near, distant & colour vision, light & dark adaptation, Refractory errors of eye & correction. Hearing: Structure and functions of external, middle and inner ear, Mechanism & Tests of Hearing Taste, Olfaction and Skin: Taste buds, papillae's, taste pathway, Olfactory mucosa, Olfactory Pathway, Adaptation of smell, unique features of olfaction, structure & functions of skin.

Practical 1 :

Section A

Physiology Practical 30 Hours

- 1) Study of Microscope and its use
- 2) Collection of Blood and study of Haemocytometer
- 3) Haemoglobinometry
- 4) White Blood Cell count
- 5) Red Blood Cell count
- 6) Determination of Blood Groups
- 7) Leishman's staining and Differential WBC Count
- 8) Determination of Bleeding Time
- 9) Determination of Clotting

Semester I

PAPER 2 :

Section B:

Basics of Biochemistry

Theory 35 Hours

1. Introduction to Medical lab Technology:
 - (a) Role of Medical lab Technologist
 - (b) Ethics, Responsibility

(c) Safety measures

(d) First aid

(e) Cleaning and care of general laboratory glass ware and equipment.

2. Introduction to Apparatus- Chemical Balance:

Different types, Principles and applications.

2. Units of Measurements: Concepts of Molecular weight, Atomic weight, Normality, Molarity, Standards, Atomic structure, Valence, Acids, Bases, Salts & indicators
4. Concepts of pH: Concepts of Acid Base reaction and hydrogen ion concentration. Definition of pH, buffer & pH meter
5. Chemistry of Carbohydrates: a. Definition, Classification and biological importance. b. Monosaccharides, Oligosaccharides, Disaccharides & Polysaccharides
6. Chemistry of Lipids: a. Definition, Classification and biological importance. b. Simple lipids: Triacylglycerol and waxes-composition and functions. c. Compound lipids : Phospholipids, Sphingolipids, Glycolipid and Lipoproteins : Composition and functions. d. Derived lipids: Fatty acids-saturated & unsaturated. Steroids and their properties.
7. Chemistry of Proteins: a. Amino acids: Classification, properties, side chains of amino acids. b. Protein: Definitions, Classifications and functions. c. Peptides: Biologically active peptides d. Overview of Structural organization of proteins. e. Denaturation of proteins and denaturing agents
8. Chemistry of Nucleic acids: a) DNA Structure and function b) RNA: Types, Structure (only t RNA) and Functions.

PAPER 2 :

Section B –

Biochemistry Practicals

Practical 30 Hours

1. Introduction to apparatus, Instruments and use of Chemical Balance.
2. Maintenance of Laboratory Glassware and apparatus.
3. Reactions of Carbohydrates (Glucose, fructose, maltose, lactose, sucrose and starch)
4. Reactions of Proteins (Albumin and Casein)
5. Colour reactions of Proteins
6. Identification of Unknown Carbohydrates and proteins

Semester I

PAPER 3 :

Section A –

Pathology Theory 25 Hours

Basic Haematology „

Introduction to Haematology:

(a) Definition

(b) Importance

(c) Important equipment used. „ Laboratory organization and safety measures in haematology Laboratory „ Introduction to blood, its composition, function and normal cellular components. „ Collection and preservation of blood sample for various haematological investigations „ Normal Values in Hematology „ Preparation of blood Films

Types.

Methods of preparation (Thick and thin smear/film)

Definition, principles & procedure, Normal values, Clinical significance, errors involved, means to minimize errors for the following:

1. Haemoglobinometry, PCV, Red Cell Indices
2. Total leucocytes count (TLC)
3. Differential leucocytes count (DLC), Absolute Eosinophil count, Reticulocyte count and Platelet Count.
4. Erythrocyte Sedimentation Rate (ESR) 5. Blood Grouping

,Staining techniques in Haematology (Romanowsky's stains) :

Principle, composition, preparation of staining reagents and procedure of the following

1. Giemsa stain
2. Leishman stain
3. Wright's stain
4. Field's stain „ Bone Marrow: Techniques of aspiration, Preparation and Staining of films, Bone Marrow Biopsy.

Scheme of Examination :

Duration : 90 Minutes

Practical 3 :

Section A

Pathology Practical 30 Hours

Basic Haematology

1. Hb Estimation-Sahli's method & Cyanmethhaemoglobin method
2. RBC Count
3. Retic Count
4. Preparation of blood smears and staining with Leishman stain
5. WBC Count
6. WBC -Differential Count

7. Platelet Count
8. Absolute Eosinophil Count
9. ESR- Westergreens & Wintrobe's method,
10. PCV.
11. Sickling test-Demonstration
12. Bone Marrow Smear preparation & staining procedure- Demonstration
13. Demonstration of Malarial Parasite.

I. Major Experiment:

Perform any two exercises

X Hb Estimation-Sahli's method

X RBC Count

X Retic Count

X Preparation of blood smears and staining with Leishman stain- WBC - Differential count

X WBC Count

X Platelet Count

X Absolute Eosinophil Count

II. Minor Experiment: Any one examination

X Reticulocyte Count

X ESR- Westergreens & Wintrobe's method,

X PCV

III. Spotters

IV. Internal Assessment

Semester I

PAPER 3:

Section B –

Microbiology Theory 25 Hours „

Introduction to Medical Microbiology: -

Definition - History - Host-Microbe relationship. „ Microscopy: - Introduction and history - Types of microscopes (a) Light microscope (b) Dark ground Microscope (c) Fluorescent Microscope (d) Phase contrast Microscope (e) Electron microscope: -Principles and operational mechanisms of various types of microscopes „ Sterilization: - Definition -- Types and principle of sterilization methods „ Physical methods- (a)

Heat (dry heat, moist heat with special Reference to autoclave - their care and maintainance.) (b) Radiation (c) Filtration, Efficiency testing to various sterilizers. „ Chemical methods „ Antiseptics and disinfectants: Definition, Types and properties - Mode of action - Uses of various disinfectants, Precautions while using the disinfectants - Qualities of a good disinfectant, In-house preparation of alcoholic hand/skin disinfectants, Testing efficiency of various disinfectants „ Antibiotics and drug resistance „ Classification of Microbes „ Bacterial Cell Growth and Nutrition „ Overview and mechanisms of Bacterial gene transfer. „ Ubiquity of microbes.

Suggested Readings:

1. Ananthanarayan and Paniker's Textbook of Microbiology. Tenth Edition. Reba Kanungo
2. Textbook of Microbiology for MLT. Second Edition. Dr. C. P. Baveja.

Practical 3 : Section B - Microbiology Practical 30 Hours „ Focusing, handling and care of Microscopes „ Hanging drop „ Simple stain „ Gram stain „ ZN stain „ Sterilization and Disinfection.

Major : Gram Stain / ZN Stain

Minor : Spotter

Suggested Readings: „ Practical Microbiology, Fourth Edition. C.P Baveja.

ENGLISH

COURSE CONTENTS:

Subsidiary subject 60 hours for 1st year marks to be sent to university before IInd year exam.

Course description:

It is designated to help the students to acquire a good command over English language for common and medical terminology used in medical practice. Behavioural objectives: Ability to speak and write proper English Ability to read and understand English Ability to understand and practice medical terminology. Paragraph Letter writing Note making Description The use of paragraphs Essay writing Telegrams Precise-writing and abstracting Report writing Medical Terminology Use of dictionary

Scheme of examination

- 1) Fill in the blanks
- 2) Articles (Passage/fill in the blanks)

3) Tense (Sentence identification / rewriting a sentence)

4) Voice (Rewrite)

5) Speech (Rewrite)

6) Linkers (Paragraph)

7) Paragraph writing

8) Letter writing

Text Books Recommended

Grammar and Composition , Wren and Martin, Delhi, Chand & Co.

Spoken English , Shashikumar V, New Delhi

Semester II

PAPER 1:

Human Anatomy Theory 40 Hours

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 positions and brief functions - with its applied anatomy.

Anatomy of Renal System.

Organization of renal system Kidneys:

Location, gross features, relations, structure, blood supply, nerve supply, lymphatic drainage and with its applied anatomy. Ureters and urinary bladder-Location, gross features, structure and with its applied anatomy Urethra in brief along with its applied anatomy.

Anatomy of Reproductive System.

Male Reproductive System:

Testis, Duct system - with its applied anatomy.

Female Reproductive System:

Uterus, Ovaries, Duct system, Accessory organs- with its applied anatomy.

Anatomy of the Endocrine System.

Name of all endocrine glands their positions, Hormones and their functions- Pituitary, Thyroid and parathyroid glands, Adrenal glands, Gonads and Endocrine part of pancreas- with its applied anatomy.

Practical 1: Human Anatomy Practicals- 20 Hours

Systemic Histology slides:

1. G.I.T - oesophagus, stomach, small intestine, large intestine, liver, pancreas and gall bladder.

2. Kidney, ureter and urinary bladder.
3. Endocrine glands - Adrenal, Pancreas, Pituitary, Thyroid and Parathyroid
4. Uterus, Ovary, Testis. Practical:
 - 1) Demonstration of the digestive system organs
 - 2) Demonstration of excretory systems organs
 - 3) Demonstration of Male & Female reproductive organs
 - 4) Demonstration of Endocrine glands.

PAPER 2 : Section A

Physiology Theory 35 Hours

Respiratory System Physiological Anatomy of Respiratory System and Functions, Dead Space.

Mechanism of Respiration, Lung volume and capacities, Surfactant, definition of compliance Transport of Oxygen, ODC Curve and CO₂ transport.

Regulation of Respiration - Types and functions of Respiratory Centres Cyanosis, Dyspnea, Apnea, Hypoxia - definition and types. Cardiovascular

System Physiological Anatomy of Heart Cardiac Cycle - Definition and Phases Cardiac Output - Definition, and factors affecting cardiac output,

Blood pressure - Definition, Determinants & Factors affecting blood pressure, regulation of blood pressure, Definition Hypertension ,

Hypotension Myocardial Ischemia and Infarction. Normal Electrocardiogram - Definition, Waves and Uses Excretory System Functional Anatomy:

Functional anatomy of kidneys, structure of a nephron, features of renal circulation, juxtaglomerular apparatus Mechanism of Urine formation:

Glomerular Filtration - Definition, glomerular filtration rate, factors effecting GFR, Tubular reabsorption, functions of Proximal convoluted

tubule, loop of Henle, distal convoluted tubule & collecting tubule. Micturition: Muscles of the bladder, nerves of bladder, micturition reflex, &

concept of Artificial Kidney Digestive System Functional Anatomy of GIT, composition & functions of saliva Composition of gastric juice,

mechanism of secretion & function of HCL Composition and functions of pancreatic juice Functions of Liver and bile Juice Definition of Jaundice

and it types Movements of GI Tract - Deglutition, Movements of Small Intestines Endocrines Major Endocrine glands ,, Pituitary Gland ,

& Posterior Pituitary Hormones and functions ,, Thyroid Gland: Hormones Secreted and Functions, Goitre ,, Adrenal Gland: Hormones secreted

by adrenal cortex and medulla and their functions ,, Pancreas: Endocrine Hormones of Pancreas and their functions, Diabetes Mellitus ,,

Parathyroid Gland: PTH, calcitonin and its actions Reproductive System Puberty: Puberty, Pubertal changes in male and female. Male

Reproductive System: Male reproductive organs, Spermatogenesis, Morphology of a sperm, Semen, Factors influencing spermatogenesis,

Functions of testosterone

Female Reproductive System: Female reproductive organs, Oogenesis, Ovulatory cycle with its hormonal basis, Tests for Ovulation, Menstrual

cycle with its hormonal basis, Functions of Estrogen & Progesterone Pregnancy & Lactation: Fertilization, Functions of Placenta, Hormones of

Placenta, Pregnancy tests, Contraceptive methods, Milk Ejection Reflex, Composition of Milk, Advantages of breast feeding.

Practical 2 :

Section A

Human Physiology Practicals 30 Hours

- 1) Recording of Pulse
- 2) Blood Pressure Recording
- 3) Effect of Exercise on BP
- 4) Effect of Posture on BP
- 5) Auscultation for Heart Sounds
- 6) Spirometry

Description of Normal Findings

- 7) Electrocardiogram of a normal person

Description of ECG waves in Lead II

- 8) Artificial Respiration.

PAPER 2 :

Section B

Basics of Biochemistry Theory 35 Hours

1. Specimen collection of blood, urine, cerebrospinal fluid and other body fluids, preservation and preparation of protein free filtrate.
 2. Enzymes: definition, classification, coenzymes, factors affecting enzyme activity and inhibitors, units of measurements, isoenzymes, Diagnostic enzymology (AST, ALT ALP, LDH, CPK and Troponin).
 3. Digestion and Absorption of Carbohydrates, proteins and lipids
 4. Nutrition - Calorific value and nutritional importance of Carbohydrates, Lipids, Proteins and Dietary fibers. BMR & Factors affecting BMR 5. Vitamins- Sources, RDA, functions and deficiency manifestations.
 6. Minerals-Calcium, Phosphorus, Iron, copper, zinc, selenium and fluoride
 7. Non Protein Nitrogenous compounds
- Clinical Significance of Urea, Uric acid, creatinine, acetone and HCL
8. Overview of Metabolism Carbohydrate Metabolism
Glycolysis, Gluconeogenesis and TCA Cycle Protein Metabolism- General Reactions of amino acids and Urea cycle.

Practical 2 :

Basics of Biochemistry Practical - 30 hours

1. Demonstration of Colorimeter, spectrophotometer, pH meter.

2. Quantitative analysis of Glucose, Urea and creatinine
3. Estimation of urine creatinine
4. Biochemically important substance- Urea, Uric acid, Creatinine, Acetone and HCL

PAPER 3 :

Section A

Haematology & Clinical Pathology Theory 25 Hours

Hematology:

1. Bone marrow a. Techniques of aspiration, preparation and staining of films b. Bone marrow biopsy 2. Preparation of buffy coat smears 3. Laboratory tests used in the investigation of anemia's a. B 12 and folate assay Normal values, derangements and interpretation of results. b. Schilling test - Method and interpretation c. Serum iron and iron binding capacity and other tests for Iron deficiency anemia-Normal values, derangements and interpretation of results 4. Laboratory test used in investigation of hemolytic anemia's a. Osmotic fragility b. Investigation of G-6 PD deficiency c. Test for sickling d. Estimation on of Hb-F, Hb-A2 e. Plasma haemoglobin and Haptoglobin, demonstration of haemosiderin in urine f. Haemoglobin electrophoresis g. Coomb's test (Direct & Indirect) - Test for auto immune hemolytic Anaemias. Clinical Pathology 1. Urine examination Physical, Chemical & Microscopic 2. Semen analysis BLOOD BANKING (Blood transfusion and Immunohaematology). 1. Collection & processing of Blood –Donor selection, Registration, Medical history, Physical examination. 2. Collection of Blood 3. Processing of Donor Blood 4. Storage & preservation of Blood. 5. ABO Blood group System 6. R.h typing and weaker variants in R.h system 7. Subgroup and weaker various of A and B and Bombay Phenotype 8. Preparations and standardization of Anti Human globulin reagent 9. Coomb's test. 10. Blood grouping and cross-matching in blood bank. 11. Diseases transmitted by Blood and their screening - Australia Antigen and Hepatitis C. Virus (HCV), HIV, Syphilis, CMV & Malaria in Blood transfusion 12. Investigation of transfusion reaction. 13. HLA Antigens and their significance in blood transfusion. 14. Blood Components- its preparation and their use in clinical practice. 15. Haemapheresis- Apheresis using cell separators Leucapheresis, plateletpheresis, plasmapheresis Adverse effects on donors. 16. Blood Bank Administration. 17. Record keeping

Immuno cytochemistry:

1. Introduction
2. Basic concepts of immunochemistry
3. Monoclonal antibodies and their preparations
4. Fluorescence reactions
5. PAP Technique - principle, preparation of reagents and Procedure.

Practical 3 :

Pathology Practicals

Practical 35 Hours

- I. HAEMATOLOGY f Sickling test-Demonstration f Bone Marrow Smear preparation & staining procedure- Demonstration f Demonstration of Malarial Parasite. f Blood grouping. , Cross matching, Blood Transfusion and immunohaematology. f Coomb's Test (Demonstration). II. CLINICAL PATHOLOGY f Visit to pathology laboratory – Postings in batches - 15 days for 2 hours f Urine examination ™ Physical ™ Chemical – Reducing substances ketone bodies, proteins and blood ™ Microscopy ™ Dipstick method – Demonstration ™ Semen Analysis Demonstration

I. Major

- a. Urine Examination
- b. Urine Microscopy
- c. Blood Grouping

II. Minor

- a. Spotters
- b. Coombs(Direct / Indirect) test Interpretation/Procedure writing

PAPER 3 :

Section B

Microbiology Theory 25 Hours

Culture media and different methods of cultivation.

Immunology– Introduction, Specific and non-specific immunity, Antigens, Antibodies – Structure and function, Complement and antigen-antibody reaction.

Suggested Readings:

- 1) Ananthanarayan and Paniker's Testbook of Microbiology. Tenth Edition. Reba Kanungo
- 2) Textbook of Microbiology for MLT. Second Edition. Dr. C.P. Baveja.

Practical 3 :

Section B

Microbiology Practicals 25 Hours

Biomedical waste management Collection of various clinical specimens . Serological tests Un-inoculated culture media and culture techniques.

Major :

Biomedical waste management

Serological tests/Inoculation techniques

Minor :

Spotters

ENVIRONMENTAL STUDIES

GOAL:

The students should gain knowledge to understand the multidisciplinary nature of the environment and the awareness of the eco system, which maintains the natural environment.

OBJECTIVES:

a) KNOWLEDGE

1. The natural resources like forest, water, mineral, food, energy and land. 2. Functions of the eco system. 3. Bio-diversity and its conservation. 4. Environmental pollution & its prevention. 5. Social issues

1. Visit local areas to understand and document environmental assets like river, forest, grassland, hill and mountain. 2. Visit an industrial area or agricultural area to know about local pollutants. 3. Identify common plants, insects and birds in their local areas. 4. Identify rivers, hills and mountains in their local areas. 5. To make use of the knowledge to protect natural resources.

COURSE CONTENTS

Theory and Field work : 50 Hours ☒ Theory - 45 hours ☒ Field work - 5 hours
1: Multi-disciplinary nature of environmental studies
Definition, scope and importance, need for public awareness. 2 hours
2: Natural Resources: Renewable and non-renewable resources:
Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

g) Role of an individual in conservation of natural resources. h) Equitable use of resources for sustainable lifestyles 8 hours
3: Ecosystems ☒
Concept of an ecosystem. ☒ Structure and function of an ecosystem. ☒ Producers, consumers and decomposers. ☒ Energy flow in the ecosystem. ☒ Ecological succession. ☒ Food chains, food webs and ecological pyramids. ☒ Introduction, types, characteristic features, structure and function of the following ecosystems:- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) 6 hours
4: Biodiversity and its conservation 8 hours ☒ Introduction - Definition : genetic, species and ecosystem diversity. ☒ Biogeographical classification of India. ☒ Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values. ☒ Biodiversity at global, National and local levels. ☒ India as a mega-diversity nation. ☒ Hot-spots of

biodiversity. ☒ Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts. ☒ Endangered and endemic species of India
☒ Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. 5: Environmental Pollution 8 hours Definition ☒ Cause, effects and control measures of:- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards ☒ Solid waste Management : Causes, effects and control measures of urban and industrial wastes. ☒ Role of an individual in prevention of pollution.

☒ Pollution case studies. ☒ Disaster management : floods, earthquake, cyclone and landslides. 6: Social Issues and the Environment 7 hours
☒ From Unsustainable to Sustainable development ☒ Urban problems related to energy ☒ Water conservation, rain water harvesting, watershed management ☒ Resettlement and rehabilitation of people; its problems and concerns. Case Studies ☒ Environmental ethics : Issues and possible solutions. ☒ Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. ☒ Wasteland reclamation. ☒ Consumerism and waste products. ☒ Environment Protection Act. ☒ Air (Prevention and control of Pollution) Act. ☒ Wildlife Protection Act ☒ Forest Conservation Act ☒ Issues involved in enforcement of environmental legislation. 7: Human Population and the Environment 6 hours ☒ Population growth, variation among nations. ☒ Population explosion - Family Welfare Programme. ☒ Environment and human health. ☒ Human Rights. ☒ Value Education. ☒ HIV/AIDS ☒ Women and Child Welfare. ☒ Role of Information Technology in Environment and human health. ☒ Case Studies. 8: Field work ☒ Visit to a local area to document environmental assets river/forest/grassland/hill/mountain ☒ Visit to a local polluted site - Urban / Rural/ Industrial/Agricultural. ☒ Study of common plants, insects, birds. ☒ Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

Semester III

PAPER I

Theory 30 Hours

BASIC NEUROSCIENCES - I

Paper I: f

Brain: Cerebrum:

Lobes, Areas and their functions, Basal Ganglia, Thalamus, Cerebellum and Brain Stem Sleep and Consciousness Spinal Cord: Structure, Tracts, Blood Supply Cranial Nerves (special emphasis on optic, trigeminal, facial and vestibulocochlear nerves). Spinal roots and peripheral nerves Brachial plexus Lumbosacral Plexus Anatomy of Individual Nerves : Median, Ulnar, Radial, Sural, Common Peroneal, Posterior Tibial Muscles: Facial muscles, Upper limb muscles and Lower limb muscles Neuromuscular Junction Visual pathway Motor pathway Auditory pathway Somatosensory pathways Motor unit Autonomic nervous system Muscle stretch reflex Muscle contraction Membrane potential Ion channels Neurotransmitters

PAPER II

Theory 30 Hours

Basics of Clinical Neurophysiology and Electroencephalography 1. Basic Principles of Patient preparation of Electrical Safety of Electrical Ground and its maintenance of Electrodes of Amplification of Signal processing of Analog to digital conversion of Sampling rate of Filters: High Frequency and Low frequency of Time Constant 2. Electroencephalography Principles of EEG Recording EEG recording Techniques Electrode Placement: 10 – 20 System and 10 – 10 System

T1 and T2 Electrodes Sphenoidal electrodes Normal EEG: Awake EEG and EEG during sleep Artifacts in EEG Recording Video EEG 3. Data acquisition & Storage 4. Impedance 5. Averaging 6. Calibration 7. Common Mode Rejection Ratio 8. Triggering – Principles and applications 9. Signal Delay

PAPER III

Theory 30 Hours

Basics of Nerve Conductions, Electromyography and Evoked Potentials

1. Nerve Conductions f

Principles of Nerve Conduction of Motor nerve conduction:

Median, ulnar, common peroneal and posterior tibial nerves of

Sensory nerve conduction: Median, ulnar, superficial peroneal and sural nerves f Late responses of H – reflex of F – response f Repetitive

Nerve Stimulation f Autonomic Nervous System of Sympathetic skin response of

Heart rate variability of Electrocardiogram

2. Electromyography f Principles of Electromyography f Electrodes for Electromyography f Qualitative Electromyography f Motor unit action potential f Interference pattern 3. Evoked Potentials f Principles of Evoked Potentials f Averaging f Visual Evoked Potentials f Auditory Evoked Potentials f Somatosensory Evoked Potentials

PAPER IV

Practicals 120 Hours

Applied Technology

Part I

1. Electrode Identification

2. Electrode Application

3. Care of EEG Electrodes

4. Maintenance of Electrodes

5. Maintenance of EEG equipment 6. EEG recording

7. Normal Awake EEG

8. Normal Sleep EEG

Practical Examinations

Spotter identifications

Electrode Applications

Normal Awake EEG Interpretation

Internal Assessment Practical

PAPER V

Practicals 120 Hours

Applied Technology

Part II

1. Electrode Identification 2. Electrode Application 3. Care of Electrodes 4. Maintenance of Electrode and ENMG machinery 5. Nerve conduction studies 6. Evoked potentials 7. Calculation of Motor Nerve Conduction Parameters 8. Calculation of Sensory Nerve Conduction Parameters 9. Interpretations of Nerve Conductions Studies

2. Practical Examination

- o Calculation of Nerve Conduction Parameters
- o Interpretations of Nerve Conductions Studies
- o Spotter identifications
- o Maintenance of Electrode
- o Internal Assessment Practical

PAPER VI

Theory 30 Hours

Communication Skills

Unit-I :

- o Communication, its types and significance: Communication, Process of communication its kinds, channels and role in the society. o Methods of Communication (Oral, Written, One way, two way communication skills). o Reading skills: - Process of reading, reading purpose, models, strategies methodologies, reading activities, structure of meaning techniques.

Unit-II Précis and Communication. Writing skills :- Elements of effective writing, writing styles, scientific and technical writing. Grammar: - Transformation of sentences, words used as different parts of speech, one word substitution, abbreviations, technical terms etc.

Unit-III Listening skills: - Process of listening, barriers to listening, effective listening skills, feedback skills. Speaking skills :- Speech mechanism, organs of speech, production and classification of speech sounds, phonetic transcription, skills of effective speaking components of an effective talk, oral presentation and the role of audio visual aids in it. Reading of text book.

Unit-IV Barriers of communication and technique to overcome those. Meaning of effective communication. Technical Report writing. Practice of writing personal resume and writing application for employment

Semester IV PAPER I Theory 30 Hours

BASIC NEUROSCIENCES II

1. Epilepsies a. Primary generalized - Generalized tonic clonic epilepsy, Absence & Myoclonic epilepsy
2. Partial - Simple partial seizures, Complex partial seizures & Partial with generalized seizures
3. Antiepileptic drugs
4. Sedatives
5. Neostigmine, Pyridostigmine
6. Disturbances of consciousness
7. Cerebrovascular disorders
8. Pyogenic meningitis
9. Tubercular meningitis
10. Encephalitis
11. Brain death
12. Brain tumors
13. Sleep disorders

PAPER II Theory 30 Hours

Applied Electroencephalography

1. Normal awake EEG
2. Normal Sleep EEG
3. Benign physiological variants of EEG
4. EEG in children
5. Maturation of EEG rhythm
6. EEG in generalized epilepsies
7. EEG in partial epilepsies

8. EEG in metabolic disease of brain
9. EEG changes in CNS infections
10. EEG in Brain Death
11. EEG in head trauma, strokes, tumors
12. EEG changes due to medications
13. Video EEG
14. Long term EEG monitoring
15. Quantitative EEG analysis
16. Spike detection
17. Brain mapping
18. Polysomnography
19. Intra – operative EEG monitoring
20. Magnetoencephalography

PAPER III

Practicals 150 Hours

Applied Technology III

- 1) Recording of EEG Patient preparation & Electrode applications Recording of EEG Identification and rectification of artifacts
- 2) Interpretation of EEG Normal EEG o Awake EEG o Sleep EEG Focal abnormalities Generalised abnormalities
- 3) Factual reporting of EEG

PAPER IV Theory 45 Hours

LAW - INDIAN CONSTITUTION I.

GOAL : The students should gain the knowledge and insight into the Indian Constitution so that they are aware of the fundamental rights and freedom bestowed through the democratic governance of our country.

II. OBJECTIVES :

A) KNOWLEDGE : At the end of the B.Sc. 1st Year course the student is expected to know:

- 1) Basic knowledge of the Indian Constitution.
- 2) Democratic institutions created by the Constitution.
- 3) Special rights created by the Constitution for regional and linguistic minorities.
- 4) Election Commission.
- 5) Legislative, Executive and Judicial powers and their functions in India.

B) SKILLS: At the end of the B.Sc. 1st Year course the student is expected to make use of knowledge:

1) To perform his / her duties towards the society judiciously and with conscious effort for self-development. 2) To utilize State policies in their future practice. COURSE CONTENTS Theory: 25 Hours

Unit I

- a) Meaning of term Constitution.
- b) Making of the Indian Constitution - 1946 - 1949 and role played by Dr. B. R. Ambedkar.
- c) Salient Features of the Constitution.
- d) Preamble of the Constitution. 2 Hours

Unit II

The democratic institutions created by the Constitution.

Bicameral System of Legislature at the Centre and in the States. Devolution of Powers to Panchayat Raj Institutions. 5 Hours Unit III Fundamental Rights and Duties - Their content and significance 5 Hours Unit IV Directive Principles of State policies - The need to balance Fundamental Rights with Directive Principles. 1 Hour Unit V Special rights created in the constitution for Dalits, Backward class, Women and Children, and the Religious and Linguistic Minorities 1 Hour Unit VI Doctrine of Separation of Powers - Legislative, Executive and Judicial, and their functions in India. 4 Hours

Unit VII

The Election Commission and State Public Service Commissions. 2 Hours

Unit VIII Method of amending the Constitution. 1 Hour

Unit IX Enforcing rights through Writs Certiorari, Mandamus, Quo warranto and Habeas Corpus. 2 Hours

Unit X Constitution and Sustainable Development in India. 2 Hours

Semester V PAPER I Theory 30 Hours

BASIC NEUROSCIENCES III

1. Peripheral neuropathies a. Axonal neuropathies b. Demyelinating neuropathies - Guillain Barre Syndrome and Chronic inflammatory demyelinating polyneuropathy
2. Mononeuritis multiplex
3. Traumatic neuropathies
4. Entrapment neuropathies
5. Compressive myelopathies
6. CNS Demyelination and multiple sclerosis
7. Inflammatory myopathies - Polymyositis and dermatomyositis

8. Muscular Dystrophies

9. Myotonia,

10. Myopathies

11. Movement disorders – tremors, dystonia, Parkinson’s disease

PAPER II Theory 30 Hours

Applied Nerve conductions, Electromyography and evoked potentials

1. Nerve conduction studies techniques

2. Physiological variables affecting nerve conductions

3. Nerve conductions in pathological states a. Demyelinating neuropathies b. Axonopathy c. Entrapment neuropathies d. Plexopathy e. Radiculopathy

4. Repetitive nerve stimulation

5. H - reflex and F – response

6. Electromyography in myopathy and neuropathy

7. Quantitative Electromyography

8. Single fiber Electromyography

9. Turns amplitude ratio

10. Evoked potentials in a. Disorders of the central nervous system b. Disorders of the peripheral nervous system

11. Event related potentials

12. Surface recording of EMG in movement disorders

13. Intraoperative monitoring a. Nerve conductions and electromyography b. Evoked potentials

14. Electronystagmography (ENG)

15. Magnetic stimulation

a. Brain b. Peripheral nerves

PAPER III

Theory 150 Hours

Applied Technology IV

1. Nerve conductions studies a. motor nerve conductions b. sensory nerve conductions c. F – response d. H – reflex

2. Recording R–R variation & sympathetic skin response

3. Interpretation of Nerve conduction graphs and data

4. Factual reporting of Nerve conductions studies

5. Recording evoked potentials a. auditory evoked potentials b. Visual evoked potentials c. Somatosensory evoked potentials
6. Factual reporting evoked potentials

PAPER IV Theory 45 Hours

Fundamentals of Computers-I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems). [™] Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. [™] Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). [™] Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet. Introduction to installation of different software and introduction about different software related to MLS. Practicals: Learning to use MS Office: MS WORD, MS EXCEL & MS PowerPoint

Guest Lecture / Tutorial / Seminar / visit to any medical research institution or reputed clinical laboratory (Compulsory) During the Professional training in the sixth semester, the student will perform the clinical neurophysiological investigations i.e. electroencephalography, nerve conductions and evoke potentials under supervision. For evaluation of Professional Training, out of 200 marks, 100 will be awarded by the Department where the candidate has taken training. The Candidate has to submit his/her project report (Log Book) before end of sixth semester. Then at the end of the semester he / she will appear for the Practical Performance in the presence of Internal & external Examiners. Out of rest 400 marks 200 will be for Project/ Practical file and 100 for Practical. The Practicals learned in the third, fourth and fifth semesters will be part of final practical evaluation at the end of sixth semester.

PAPER II Theory 45 Hours

Human Values and Professional Ethics

Unit-I

1. Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education. Self Exploration—what is it?- its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Unit-II

2. Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Swasthya (6 Hrs)

Unit-III

3. Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship Understanding the meaning of Vishwas; Difference between intention and competence Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family! (6 Hrs.)

Unit-IV

4. Understanding Harmony in the Nature and Existence - Whole existence as Co- existence Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of naturerecyclability and self-regulation in nature Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space Holistic perception of harmony at all levels of existence (4 Hrs)

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values Definitiveness of Ethical Human Conduct

Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems Ability to identify and develop appropriate technologies and management patterns for above production

systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers At the level of society: as mutually enriching institutions and organizations

Text Book: (6 Hrs.)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.

Other Suggested Readings / Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management

Internal Assessment 1.

Internal Assessment will be undertaken for theory and practical periodically as per the semester system and the average marks of the tests will be calculated and reduced to 20 or 10 as applicable and the marks are to be communicated to the university.

Declaration of result

1. Criteria for pass

a. Main subject: A Candidate is declared to have passed the examination in a subject, if he/she secures 40% of the total marks in Theory and Practical separately. b. Elective Subjects: The minimum marks for a pass in a elective subject shall be 35% of the maximum marks prescribed for a subject and the marks shall be communicated to the University before the commencement of the Practical examination. c. In case a candidate fails in either theory or practical, he/she has to appear for both theory and Practical in the subject in any subsequent examination and he/she

must obtain the minimum for a pass in the subject (theory and practical separately) d. A candidate shall be declared to have passed the examination if he/she passes in all the main subjects. Carry over System: At any given point of time a candidate shall have subjects pending to clear of only previous semester in addition to the subjects of the current semester that he/she is appearing for. Example:- If the candidate has not cleared semester I, he/she can appear for semester II and pending subjects of semester I simultaneously. For appearing for semester III he/she should have cleared semester I and can appear for papers pending from semester II along with semester III subjects. For appearing for semester IV he/she should have cleared semester II and can appear for papers pending from semester III along with semester IV subjects.

For appearing for semester V he /she should have cleared semester III and can appear for papers pending from semester IV along with semester V subjects. For appearing for semester VI he/she should have cleared semester IV and can appear for papers pending from semester V along with semester VI subjects. Examiners: There should be minimum two examiners, one internal from the same university and one external Examiners for the First year subjects and for Pharmacology in the second year shall have Postgraduate degree in the respective subject with 3 years teaching experience of M.Sc. (Medical) with 5 years teaching experience.

Suggested Readings:

Human Anatomy ,B.D.Chaurasia, C.B.S.Publishers

Text book of Histology, J.P. Gunasegaran, Elsevier Publication, Gurgaon

Biochemistry, U. Satyanarayan, Books and Allied (P) Ltd

Practical Pathology, P. Chakraborty, New Central Book Agency

Text Book of Haematology, Dr. Tejinder Singh, Arya Publications, Sirmour (H.P)

Textbook of Physiology, Arthur C. Guyton, Prism Publishers, Bangalore

Environmental Biology, Agarwal, K.C, Nidi Publication Ltd.