PROGRAMME

MASTERS OF SCIENCE IN MEDICAL SUBJECTS

FACULTY OF MEDICINE



Ordinance- V (43)

(Approved by Academic Council and applicable from 2018-2019 Session)

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

MEERUT

Ordinance No. V (43A)

ORDINANCE RELATING TO MASTER OF SCIENCE (M.Sc.) COURSE IN MEDICAL SUBJECTS

Chapter -1 General

1. This ordinance may be called the "Ordinance Relating to Master of Science (M.Sc.) course in Medical Subjects".

2. (i) It shall come into force with immediate effect.

   (ii) This supersedes the previous Ordinance relating to Master of Science (M.Sc.) course in Medical Subjects [V-(43A)].

Chapter -2 Eligibility for Admission

3. (i) An applicant holding one of the following degrees or equivalent from a recognized university/institute shall be eligible to apply for this course subject to the stipulations laid down in the subsequent sub-clauses:

   (a) MBBS, (b) BDS, (c) BAMS, (d) BHMS, (e) BPT, (f) BNYS, (g) B.Sc. (Nursing).

   (ii) An applicant with B.Sc. degree in Nutrition/ Home Science shall be eligible to apply for M.Sc. course in Medical Physiology only.

   (iii) An applicant with B.Sc. degree in Biochemistry shall be eligible to apply for M.Sc. course in Medical Biochemistry only.

   (iv) An applicant with B.Sc. degree in Microbiology shall be eligible to apply for M.Sc. course in Medical Microbiology only.

4. An applicant with B. Pharm. degree shall be eligible to apply for M.Sc. course in Medical Pharmacology only. The M.Sc. in Medical subject course shall be of three-year duration, comprising three academic years.

5. Presently specialized courses are available for M.Sc. in the following subjects, any of which one selected by a student: - Medical Anatomy, Medical Physiology, Medical Biochemistry, Medical Pharmacology, and Medical Microbiology.

6. The academic calendar shall be as follows:

I, II and III academic years	Session:- 1st July to

31st May.
Exam:- 1st
June to 15th
June.

NETAJI SUBHASH CHANDRA BOSE SUBHARTI MEDICAL COLLEGE, MEERUT

M.Sc. Medical Anatomy

Year of Implementation: 2001 – 02

DEPARTMENT OF FORENSIC MEDICINE
SUBHARTI MEDICAL COLLEGE
SWAMI VIVEKANAND SUBHARTI UNIVERSITY
MEERUT (U.P.) 250005

Programme Structure and Courses offered in M.Sc. Medical Anatomy

1st YEAR

S. No.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc. - 101(A)	General Anatomy, Physiology & General Biochemistry	100	100
2.	M.Sc. - 102 (A)	Anatomy (Specialization)	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

2nd Year

S. No.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc.-201 (A)	Histology and Histochemistry	100	100
2.	M.Sc.-202 (A)	Thorax, Abdomen, pelvis & related Embryology	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

3rd Year

S. No.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc.-301 (A)	Neuroanatomy, Genetics, Immunology	100	100

2.	M.Sc.-302 (B)	Head, Neck & related Embryology	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

SYLLABUS FOR M.Sc. ANATOMY

(A) - Gross Anatomy

Course Content: -

(A) Upper Extremity: -

1 Bones of upper limbs
2 Superficial structure of the upper limb (Superficial veins, nerve and lymphatic drainage)
3 Mammary glands
4 Pectoral regions
5 Axilla
6 superficial muscles of back
7 Scapular and deltoid regions
8 The arm
9 The forearm
10 The hand
11 Joints of upper limb
12 Radiology and surface anatomy of upper limb

(B) Lower Extremity: -

1 Bones of lower limb
2 Front of thigh
3 Gluteal region
4 Back of thigh (Flexor compartment)

5 Popliteal fossa
6 Posterior crural region (Flexor compartment)
7 Sole of foot
8 Anterior crural region (Extensor compartment of leg)
9 Lateral crural region (Peroneal compartment of leg)
10 Dorsum of foot
11 Joints of lower limb
12 Arches of foot
13 Walking cycle and joint
14 Radiology and surface anatomy of lower limb

(C) Head and Neck: -

1 Skull

a	Occipital bones	b	Parietal bones
c	Frontal bones	d	Sphenoid bone
e	Temporal bone	f	Zygomatic bone
g	Maxillae	h	Mandible
i	Norma frontalis, verticalis, occipitalis lateralis, basalis	j	Interior of skull
k	Neonatal skull	l	Growth of skull

2 Scalp and face
3 The neck
4 Anterior triangle of neck
5 Submandibular and parotid regions
6 Temporal and infratemporal regions
7 Deep structures of neck
8 Interior of the cranium
9 Orbit and its contents
10 Nose and para nasal sinuses
11 Mouth, palate, tongue and teeth
12 Pharynx, palatine tonsils and auditory tube
13 Larynx
14 Ear
15 Surface anatomy and radiology of head and neck

Thorax: -

1 Thoracic cage
   a Skeleton of thorax
   b Intercostal spaces
   c Respiratory movements
2 The pleura, lungs

3 Mediastinum
4 Trachea
5 Pericardium
6 The Heart
7 Superior vena cava
8 Esophagus
9 Phrenic nerve, vagus nerve, sympathetic trunk
10 Surface and radiological anatomy of thorax

Abdomen: -

1 Anterior abdominal wall
2 Posterior abdominal wall
3 Diaphragm
4 Perineum
5 Pelvic diaphragm
6 Abdominal part of esophagus
7 Stomach
8 The small intestine
9 Large intestines
10 Liver
11 Pancreas
12 Spleen
13 Portal vein
14 Peritoneum
15 Urinary system
16 Male genital system
17 Female genital system
18 Pelvic fascia and endopelvic fascia
19 Pelvis - a Bony pelvis
b Blood vessels and nerves of pelvis
20 Surface and radiological anatomy of abdomen

Practical: -

1 Dissection of entire body
2 Preparation of Museum specimens
3 Casts
4 Plastination
5 Fixation and preservations of human body (Embalming)

(B) - Histology and Histochemistry

Course Content: -

1. Overview of methods used in histology
2. Tissue preparation
3. Histochemistry and cyto chemistry
4. Microscopy
5. Cell cytoplasm
   a. Overview of cell and cytoplasm
   b. Membranous organelles
   c. Non membranous organelles
   d. Inclusions
   e. Cytoplasmic matrix
6. Cell nucleus
   a. Overview of nucleus
   b. Nuclear components
   c. cell renewal
   d. Cell cycle
   e. Cell death
7. Tissue concept and classification
   a. Epithelium
   b. Connective tissue
   c. Muscle tissue
   d. Nerve tissue
   e. Identifying tissue
8. Cartilage
9. Bone
10. Adipose tissue
11. Blood
12. Cardiovascular system
13. Lymphatic system
14. Integumentary system
15. Digestive system
16. Respiratory system
17. Urinary system
18. Endocrine system
19. Male reproductive system
20. Female reproductive system
21. Eye, Ear

Practical: -

1 Preparation of histological section
2 Light microscopy and its applications
3 Electron microscopy and its application
4 Routine histological stains
5 Special stains
6 Identification of normal organelles in electron micrographs
7 Three-dimensional interpretation, artifacts identification

(C) - Genetics

Course Content: -

Normal and abnormal chromosomes, Molecular genetics, developmental genetics, immunogenetics population genetics and genetic counselling.

1. Human Chromosomes – Structure, number and classification, methods of chromosome preparation, banding patterns. Chromosome abnormalities, Autosomal abnormalities – syndromes, Sex chromosomal abnormalities – syndromes, Molecular and Cytogenetics
2 Single gene pattern inheritance, Autosomal and Sex chromosomal patterns of inheritance, intermediate pattern and multiple alleles, Mutations. Non-Mendelian inheritance, Mitochondrial inheritance, Genomic imprinting, parental disomy.
3. Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure of gene, Molecular screening, Cancer Genetics – Hematological malignancies, Cancer Genetics Pharmacogenetics.
4 Reproduction Genetics – Male infertility, Female infertility, assisted reproduction, Preimplantation genetics, prenatal diagnosis, Genetic Counselling Ethics and Genetics

Practical

DNA Isolation form peripheral blood lymphocytes, polymerase Chain Reaction (PCR), Fluorescence In-Situ Hybridization (FISH), Chromosomal Analysis

(D) - Developmental Anatomy

Course content: -

1 Introduction to molecular regulation and signaling
2 Gametogenesis
3 First week of Development ovulation to implantation
4 Second week of development (Bilaminar germ disc)
5 Third week of development (trilaminar germ disc)

6 Third to eight weeks (The embryonic period)
7 Third month to birth (The fetus and placenta)
8 Birth defects and prenatal diagnosis
9 Skeletal system
10 Muscular system
11 Body cavities
12 Cardiovascular system
13 Respiratory system
14 Digestive system
15 Urogenital system
16 Head and Neck
17 Central nervous system
18 Ear
19 Eye
20 Integumentary system

Practical: -

1 Study of models, specimens of early human development
2 Correlation with avian and mammalian early development with human development
3 Specimens of congenital malformations

(E) - Immunology

Course Content

Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body. Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response. Common techniques employed in cellular immunology and histocompatibility testing. Molecular hybridization and PCR technology research particularly mechanism of antigen presentation, structural and functional relevance of the T Cell receptor, genetic control of the immune response molecular basis of susceptibility to disease.

Practical

Techniques of DNA preparation, electrophoresis and southern blot test, hybridization.

(F) - Neuroanatomy

Course Content: -

1 Brain and its development
2 Neuron and Neuroglia
3 Somatic sensory system
4 Receptors and effectors
5 Dermatomes and muscular activities
6 Central nervous system overview
7 Spinal cord
8 Brain stem
9 Nuclei functional components and distribution of cranial nerves
10 Cerebellum and fourth ventricle
11 Diencephalon and third ventricle
12 Cerebrum
13 Basal nuclei (Basal ganglia)
14 White matter of cerebrum and lateral ventricles
15 Blood supply of brain
16 Meninges and cerebrospinal fluid
17 Somatic and motor and sensory pathways
18 Special senses and their neural pathways
19 Central autonomic pathways
20 Reticular formation and limbic system

Practical: -

1 Identification of structures in sections of brain stem and spinal cord at different levels
2 Staining nervous tissue using nissil staining and other special stains.

Recommended Books: -

1. Gray's Anatomy 38th edition, 1995 reprint in 2000 — Williams et all Churchill Livingstone
2. Wheaters functional Histology 4th ed. (2000) — B. Young and J. Heath Churchill Livingstone
3. Histology A text & atlas 3rd edition (1995) — M.H. Ross, E & L.J Williams & Wilkins
4. Medical embryology 8th edition — Jan Langman William and Wilkins
5. Genetics in medicine 6th edition, 2001 — J.S Thompson & W.B. Saunders & Co. M.W. Thompson
6. Human Neuroanatomy 9th edition, 1996 — Stuin J and Carpenter MB
7. Clinical Neuroanatomy for Medical students — Richard S. Snell Willian and Wilkins

NETAJI SUBHASH CHANDRA BOSE SUBHARTI MEDICAL COLLEGE, MEERUT

M.Sc. Medical Physiology

Year of Implementation: 2001 – 02

Ordinance

DEPARTMENT OF PHYSIOLOGY

SUBHARTI MEDICAL COLLEGE

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

MEERUT (U.P.) 250005

Programme Structure and Courses offered in M.Sc. Medical Physiology

1st YEAR

S.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc. - 101	General Anatomy, Physiology & General Biochemistry	100	100
2.	M.Sc. - 102	Physiology (Specialization)	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

2nd Year

S.	Paper code	Paper	University Exam	Subject Total
1.	M. Sc. 201 (P)	Endocrinology	100	100
2.	M. Sc. 202 (P)	CNS and special senses	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

3rd Year

S.	Paper code	Paper	University Exam	Subject Total

1.	M. Sc. 301 (P)	Systemic Physiology	100	100
2.	M. Sc. 302 (P)	Applied Physiology, Recent Advances	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

SYLLABUS FOR M.Sc. PHYSIOLOGY

AIM:

- To provide intensive and extensive training of the students in a manner that at the end course they shall be well acquainted with the knowledge of Physiology as well as in research modalities and data analysis. They are supposed to assist and conduct the teaching learning activities for the undergraduate students independently.

TEACHING PROGRAMME

• The postgraduate curriculum includes the entire undergraduate curriculum in detail with recent advances in each topic.

• The training programme consists of lectures practical, seminars, symposia, journal clubs and group discussions.

• Maintenance of practical file is compulsory.

• Research methodology and biostatistics is also part of the curriculum.

MSc Physiology course will be of 3 years. The course, apart from usual teaching learning modalities will have a research project (Dissertation) to be undertaken by the student and supervised by the faculty member assigned to the project. The course will be divided into SIX semesters and the basic components in each semester will be as follows:

SEMESTER- 1

- Orientation to the department
- Decide on the research project and the guide
- Protocol writing
- **Course Contents**
- Systems
    - General Physiology
    - Hematology
    - Nerve Muscle Physiology

SEMESTER- 2

- Research Project work
- **Course Contents**
- Systems
    - Cardiovascular physiology
    - Respiration
    - Gastrointestinal Physiology
    - Nutrition and metabolism

SEMESTER - 3

- **Course Contents**
- Systems
    - Renal Physiology
    - Environment physiology
    - Reproductive physiology
- Research Project work

SEMESTER- 4

- Research work project work
- **Course Contents**
- Systems
    - Endocrine Physiology
    - General, Sensory and Motor Physiology
    - Special senses
    - Higher functions

SEMESTER- 5

- Theory and practical work
- Research project submission
- Attending under graduate physiology classes

SEMESTER- 6

- Theory and practical work
- Attending under graduate physiology classes
- Departmental presentation of the finished research project work and submission for approval

Practical skills

A) Hematology experiments:

- Estimation of hemoglobin

- Determination of total erythrocyte (RBC) count.

- Determination of RBC Indices (Blood standards)

- Determination of total leucocytes (WBC) count: TLC

- Preparation of a peripheral blood smear and determination of differential

leukocyte count: DLC.

- Determination of Arneth count.

- Determination of bleeding time (BT) and clotting time (CT).

- Determination of blood groups (A,B,O and Rh system)

- Determination of specific gravity of blood.

- Determination of erythrocyte sedimentation rate (ESR) and packed cell volume

(PCV).

- Determination of osmotic fragility of red blood cells.

- Determination of platelet count.

- Determination of reticulocyte count.

- Determination of absolute eosinophil count.

- Study of haemopoietic cells present in the bone marrow.

B) Animal experiments:

i) Amphibian (frog) experiments.

- Effect of temperature on simple muscle twitch

- Effect of two successive stimuli (of same strength)

- Effect of increasing strength of stimuli.

- Effect of increasing frequency of stimuli (genesis of tetanus)

- Effect of free load and after load.

- Effect of repeated stimuli (study of phenomenon of fatigue).

- Determination of conduction velocity of sciatic nerve and effect of variables on it.

- Heart experiments:

Properties of cardiac muscle

Regulation of heart - effect of vagus nerve and WCL stimulation

Effect of variables.

ii) Mammalian experiments (rabbit)

- General management of mammalian experiments.

- Perfusion of isolated mammalian heart and to study the effect of drugs and ions.

- Recordings of isolated intestine - movement & tone and to study the effect of drugs and ions.

- Other experiments on intact animal.

C) Human Physiology

a. Clinical Physiology

- Elementary principles of clinical examination

- General physical examination.

- General principles of inspection / palpation / percussion / auscultation

b. Nerve Muscle Physiology

- Ergography and hand grip spring dynamography – study of phenomenon of human fatigue.

- Recording of electromyography (EMG)

c. Cardiovascular system (CVS)

- Clinical examination of CVS

- Examination of arterial and venous pulses.

- Measurements of arterial blood pressure.

- Recording of 12 lead electrocardiography (ECG) and its interpretation.

d. Respiratory system

- Clinical examination of respiratory system

- Stethography – study of respiratory movements and effect of various factors.

- Assessment of ventilatory functions – vitalography

- Spirometry – study of lung volumes and capacities.

- Measurement of BMR.

- Cardio pulmonary cerebral resuscitation and artificial respiration.

e. Abdominal system:

- Clinical examination of abdomen.

f. Nervous system including special senses.

- Clinical examination of the nervous system and its physiological basis

- Examination of higher mental functions.

- Examination of cranial nerves.

- Examination of sensory system

- Examination of motor system including reflexes

- Clinical examination of special senses:

(i) Smell and taste

(ii) Tests of hearing

(iii) Ophthalmology:

(a) Clinical examination of the eye and pupillary reflex

(b) Visual acuity

(c) Perimetery –mapping out of visual field and blind spot

(d) Accommodation

(e) Fundoscopy

(f) Colour vision and colour blindness

- Reaction time (visual and auditory) and reflex time

- Electroencephalography (EEG)

- Autonomic function tests (AFT)

- Neuroelectro diagnostic techniques:

(i) Nerve conduction study

(ii) Visual evoked potential (VEP)

(iii) Brainstem auditory evoked potential (BAEP)

(iv) Somato- sensory evoked potential (SEP)

(v) Motor evoked potential (MEP)

h. Others: Tests for physical fitness: Cardio-respiratory responses to steady state exercise using Harvard step test, bicycle ergometry and treadmill test;

NETAJI SUBHASH CHANDRA BOSE SUBHARTI MEDICAL COLLEGE, MEERUT

M.Sc. Medical Biochemistry

Year of Implementation: 2001 – 02

Ordinance

DEPARTMENT OF BIOCHEMISTRY

SUBHARTI MEDICAL COLLEGE

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

MEERUT (U.P.) 250005

Programme Structure and Courses offered in M.Sc. Medical Biochemistry

1st YEAR

S.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc. - 101(B)	General Anatomy, Physiology & General Biochemistry	100	100
2.	M.Sc. - 102 (B)	Biochemistry (Specialization)	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

2nd Year

S.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc.-201 (B)	Clinical Biochemistry-I & Genetics	100	100
2.	M.Sc.-202 (B)	Molecular Biology & Immunology	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

3rd Year

S.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc.-301	Clinical Biochemistry-II	100	100
2.	M.Sc.-302	Recent Advances including instrumentation & techniques in experimental biochemistry	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

SYLLABUS FOR M.Sc. BIOCHEMISTRY

First Year

Paper-I GENERAL ANATOMY, PHYSIOLOGY & GENERAL BIOCHEMISTRY

Paper-II GENERAL MEDICAL BIOCHEMISTRY

CARBOHYDRATES:

- Definition, Chemistry Metabolism, Classification, Common Carbohydrates their sources and complication
- Digestion and absorption of carbohydrates.
- Glycolysis-aerobic, anaerobic, energetic, regulation, Krebs cycle.
- Citric acid cycle and its energetic.
- Glycogenesis, glycogenolysis and their regulation, role of liver and muscle glycogen.
- Gluconeogenesis.

- HMP Pathway.
- Hormonal regulation of blood sugar level.
- Important metabolic disorders of glycogen, lactose intolerance, diabetic mellitus.

PROTEIN:

- Definition of proteins and amino acids, Functions of proteins, Digestion and absorption of proteins, Classification of amino acids and proteins, Structural organization of protein, metabolism of amino acids and inborn disorders of metabolism,
- Specialized products of amino acids phenylalanine, tyrosine, tryptophan, glycine, methionine, Transamination, Deamination and urea cycle (Protein)

LIPIDS:

- Chemistry: Definition, classification of lipids, classification of fatty acids, examples and function of common lipids, essential fatty acids and their importance.
- Digestion and absorption of lipids.
- Oxidation and its energetic, regulation.
- Fat metabolism in adipose tissue, lipoprotein lipase.
- Ketone body formation and utilization.
- Cholesterol and its importance, common hyper- lipoproteinemia.
- Classification, functions & metabolism of lipoproteins, Atherosclerosis.

ENZYMES:

- Definition, coenzymes, factors affecting enzymes activity, isoenzymes and clinical significance of enzymes, regulation of enzyme activity, inhibition of enzymes.

NUCLEIC ACID:

- Nucleotide chemistry, metabolism
- Structure, Functions of DNA, RNA, Genetic Code.

BIOLOGICAL OXIDATION, ELECTRON TRANSFER CHAIN AND OXIDATIVE PHOSPHORYLATION.

VITAMINS:

- Definition, classification according to solubility, individual vitamins, sources, coenzyme forms, functions, RDA, Digestion, absorption and transport, deficiency and Toxicity.

MINERALS:

- Individual minerals calcium, phosphate, iron, Magnesium, Zinc, fluoride, selenium, molybdenum, copper; their sources, RDA, digestion, absorption transport excretion, functions disorders.

MUSCLES CONTRACTION:

- Contractile element in muscles, process of muscle contraction.

CONNECTIVE TISSUE:

- Biochemistry of connective tissue, collagen, glycoproteins and proteoglycans.

CELL BIOLOGY:

- Cell membrane structure, Intracellular organelles and their functions, briefly in cytoskeleton.

HORMONE ACTION:

- Receptors signal transduction, second messengers (Ca, CAMP, Inositol Phosphates) and cell function.

ACID- BASE BALANCE, WATER AND ELECTROLYTES:

- Body water, osmolarity, Extra and intracellular sodium and potassium, Ph., Buffer system in blood, Role of lungs and kidneys in acid- base balance.

NUTRITION:

- Basal metabolic rate- definition normal values, factors affecting B.M.R.
- Energy requirements (with age sex), thermo genesis, specific dynamic action of food, energy expenditure for various activities.
- Nutritional aspects of carbohydrates, fat and fibers.

- Nutritional aspects of proteins, essential amino acids, chemical score, digestibility coefficient classification of proteins (complete and incomplete)
- Nitrogen balance and its significance. Composition of Food, balance diet, dietary recommendations and nutritional supplementation. Protein- energy malnutrition, kwashiorkor and marasmus.

CLINICAL BIOCHEMISTRY

- Relevance of blood level of glucose, urea, ca-phosphates, lipid profile, Urine examination for abnormal constituents (quantitative & qualitative), creatinine, proteins. Clinically important enzymes.
- Liver and renal function tests

Second Year

Paper I: CLINICAL BIOCHEMISTRY I and GENETICS

CLINICAL BIOCHEMISTRY I

- Relevance of blood level of glucose, urea, ca-phosphates, lipid profile, Urine examination for abnormal constituents (quantitative & qualitative), creatinine, proteins. Clinically important enzymes.
- Liver and renal function tests
- General Laboratory techniques, Procedures & Safety measure.
- Specimen collection & other pre-analytical variables.
- Analytical techniques & instrumentation including spectrophotometric techniques, light emission & scattering techniques.
- Basic principles of radioactive measurements.
- Electro chemistry.
- Electrophoresis.
- Chromatography & Mass spectrophotometer.
- Principles of clinical enzymology.
- Principles of Immuno- chemical techniques.
- Nucleic acid techniques
- Automation in clinical laboratory.
- Evaluation of methods & introduction to statistical techniques.
- Reference values.
- Laboratory informatics.
- Laboratory & quality management.
- Basic chemistry & analytical applications of amino acids.
- Proteins.
- Enzymes.
- Carbohydrates & Lipids.

- Chemistry & Metabolism of proteins, Enzymes, non-protein nitrogen, metabolites and carbohydrates, lipids and lipoproteins.
- Electrolyte and blood gases.

GENETICS

- Mitosis, meiosis, cell cycle, allele's inheritance, overview of genetic diseases, medallion and non-medallion disorders of inheritance, evolution

Paper-II Molecular Biology and Immunology

Molecular Biology

- Includes Cancer Biochemistry & molecular biology of cancer- growth factors and oncogenes.
- Nucleic acids- Purines and pyrimidines- biosynthesis and degradation, structure and function of DNA & RNA, organization of DNA, replication, transcription, protein biosynthesis and gene regulation: Genetic code, mutations and mutants, DNA repair. Recombinant DNA technology, cloning, construction of genomic libraries, strategies for screening DNA libraries, telomeres and telomerase, cell-cell interaction, adhesion molecule, receptor- structure and regulation signal transduction.
- Recombinant DNA technology
- Restriction endonuclease and restriction maps
- DNA sequencing, importance for genetic disorder
- Recombinant DNA and cloning
- DNA libraries
- Expression vectors and fusion proteins
- Site directed mutagenesis
- Applications
- Genomics, Proteomics and micro array analysis
- Gene therapy
- Transgenic animal model

Immunology

- An Overview of Immune System
- Innate (Non-Specific) Immunity
- Complement System and Its Receptors
- Antigen
- Immunoglobulin: Structure and Function
- Immunoglobulins: Iso-, Allo- and Idiotypes
- Immunoglobulins: Genetics
- Antigen-Antibody Interactions
- Biogenesis of Antibodies
- Cells Involved in Immune System

- Major Histocompatibility Complex (MHC) and T-Cell Receptors
- Response to Antigen
- Cell Interaction in Specific Immune Response
- Immune Regulation
- Immunization
- MHC: Genetics and Role in Transplantation
- Tolerance and Autoimmunity
- Hypersensitivity Reactions
- Immune System and Tumor Immunology
- Immunodeficiency
- Human Immunodeficiency Virus (Acquired Immunodeficiency Syndrome)
- Immunocytochemistry
- Immunologically Privileged Sites

Third Year

Paper I: CLINICAL BIOCHEMISTRY II

- General Laboratory techniques, Procedures & Safety measure.
- Specimen collection & other pre-analytical variables.
- Analytical techniques & instrumentation including spectrophotometric techniques, light emission & scattering techniques.
- Basic principles of radioactive measurements.
- Electro chemistry.
- Electrophoresis.
- Chromatography & Mass spectrophotometer.
- Principles of clinical enzymology.
- Principles of Immuno- chemical techniques.
- Nucleic acid techniques
- Automation in clinical laboratory.
- Evaluation of methods & introduction to statistical techniques.
- Reference values.
- Laboratory informatics.
- Laboratory & quality management.
- Basic chemistry & analytical applications of amino acids.
- Proteins.
- Enzymes.
- Carbohydrates & Lipids.
- Chemistry & Metabolism of proteins, Enzymes, non-protein nitrogen, metabolites and carbohydrates, lipids and lipoproteins.
- Electrolyte and blood gases.

PRACTICALS:

General

- General laboratory techniques & procedures, reference methods, glassware, hazards in lab
- Specimen collection & processing
- Biological variation
- Laboratory management, health care delivery strategies, financial & HR management, planning & lab set up
- Quality management, analytical & preanalytical variables, control material & charts, quality control and proficiency testing
- Diagnostic test on urine:
- Collection and preservation.
- Physical Characteristics and specific gravity.
- Normal constituents:
- Qualitative test for Urea, Uric Acid, Creatinine, Calcium, Phosphorous, Sodium Potassium and Chloride.
- Titrable acidity and Ammonia.
- Urea clearance and creatinine clearance.
- Abnormal constituents of Urine:
- Qualitative test for: Sugar Albumin, Ketone bodies, Blood, Bile salt and Pigments.
- Determination of sugar and albumin in urine.
- Additional qualitative test for urine lactosuria, Pentosuria, Alkaptonuria and phenylketonuria.
- Diagnostic test on Blood:
- Collection and preservation of blood, Serum and Plasma.
- Determination of blood glucose tolerance tests.
- Glucose tolerance test.
- Non- proteinnitrogenous compound:
- Determination of serum urea, uric acid and creatinine.
- Determination of serum Proteins:
- A.G ratio, Serum Electrophoresis and Zinc sulfate turbidity test.
- Serum Electrolytes:
- Determination of Na+, K+ and Cl.
- Determination of Inorganic phosphorous.
- Determination of Ca.
- Serum enzymes:
- Determination of transaminases (GOT and GPT).
- Determination of phosphates (Alkaline phosphatase and Acid Phosphatase).
- Determination of amylase.
- Liver function tests
- Serum Bilirubin, Determination of Total and direct bilirubin.
- Serum Lipids:
- Determination of serum Cholesterol. Lipid profile,
- Diagnostic test on other body fluids:
    - Gastric Juice: Tests for HCl. Bile pigments, Blood, Bile salts and Starch.
    - Free and total acidity.
    - Gastric function test.

- Cerebrospinal fluid:
  - Determination of sugar.
  - Determination of Proteins
  - Pondy's test.
- Laboratory maintenance and improvement:
- Quality control
- Automation and Kits
- Laboratory managements.
- Kidney function tests.

Specific

- Analysis of various analytes and related pathophysiology, amino acids, proteins, nucleic acids, lipids, LP, carbohydrates (glucose, fructose, HbA, C, KB, lactate, tumor markers, hormones and related pathophysiology
- Clinical enzymology
- Therapeutic drug monitoring
- Electrolytes & blood gas analysis
- Minerals Ca, P, Fe, Z, F, Zn their analysis and pathophysiological aspects
- Pathophysiology of water & electrolyte balance, LFT, KFT, cardiac functions, TFT
- Radioactivity & its use in lab
- Biomedical waste management

Paper II: Recent Advances including instrumentation & techniques in experimental biochemistry

- General laboratory Techniques and procedures, pH meter, balances.
- Centrifugation, sub- cellular fractionation
- Purification of an enzyme and study of its kinetics
- Chromatography
- Electrophoresis techniques immune-diffusion and Isoelectric focusing, HPLC
- Immunoassay techniques Immuno-electrophoresis, immunoblotting.
- Spectroscopy techniques, including NMR.
- Radioactive Isotopes their application in biomedical research and clinical diagnosis and measurements of radioactivity, tracer techniques, autoradiography and micro assays like RIA, ELISA, estimation of hormones etc.
- Molecular diagnostics, recombinant DNA technology and its applications.
- Microscopy- light microscopy electron microscopy and cell culture.
- Environmental biochemistry and detoxification
- Genomics, proteomics and microarray technology
- Operation of PCR and its applications
- Clinical Biochemistry.

PRACTICAL, shall include the following;

- Fractionation of proteins,
- Restriction digestion of DNA,
- Separation of lipoproteins by electrophoresis, agarose gel electrophoresis of DNA,
- PAGE,
- ELISA, dot ELISA, estimation of different hormone levels, HCV, HbsAg and HIV in human blood by RIA/ELISA
- Affinity purification of IgG by protein A sepharose column chromatography,
- Immunodiffusion,
- Factors affecting enzyme activity,
- Colorimetric estimation of bilirubin, urea, LDL and HDL cholesterol in serum, enzymatic estimation of glucose,
- Estimation of markers including the newer cancer markers.
- UV characterization of DNA and fluorometric properties of proteins,
- Case presentation: Short and long cases; students need to take history, examine the patient, plan investigations, perform all the biochemical investigations and reach to a diagnosis, student should be able to explain the biochemical finding and co-relate them with clinical picture.

NETAJI SUBHASH CHANDRA BOSE SUBHARTI MEDICAL COLLEGE, MEERUT

M.Sc. Medical Microbiology

Year of Implementation: 2001 – 02

Ordinance

DEPARTMENT OF MICROBIOLOGY

SUBHARTI MEDICAL COLLEGE

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

MEERUT (U.P.) 250005

Programme Structure and Courses offered in M.Sc. Medical Microbiology

1st YEAR

S.No.	Paper code	Paper	University Exam	Subject Total
1.	M.Sc. - 101(M)	General Anatomy, Physiology & General Biochemistry	100	100
2.	M.Sc. - 102 (M)	Microbiology (Specialization)	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

2nd Year

S.No.	Paper code	Paper	University Exam	Subject Total
1.	MMB-201	Systemic Bacteriology	100	100
2.	MMB-202	Parasitology	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

3rd Year

S.No.	Paper code	Paper	University Exam	Subject Total
1.	MMB301	Virology & Mycology	100	100
2.	MMB302	Clinical Microbiology & Recent Advancement	100	100
		Total	**200**	**200**
3.	Practical/ Clinical	Practical Examination	100	100
	Grand Total		**300**	**300**

Syllabus of M.Sc. Medical Microbiology

HUMAN ANATOMY

Unit-I

General Anatomy: Introduction of anatomy: organization of human body tissues and organ systems: Cellular organization of tissues and organs: Cell division.

Skin: Structure and functional! anatomy of skin.

Unit-II

Muscular System: Different types of muscles and their structure, Structure if sarcomere. Origin & insertion, tendons; Aponeurosis; Wasting and degeneration of muscles.

Skeletal System: Components of axils and appendicular skeleton; Development of bones: various joints their structure and function.

Digestive System; Morphology of gastro-intestinal system; Structure of different digestive and associated glands.

Unit-III

Respiratory System: General anatomy of lungs, pleura, broncho-pulmonary segments. interoastal museles and diaphragm.

Cardiovascular System: Various components of biood — vascular system; Blood and connective tissue. Structure of various part of heart, Lymph circulation, Lymph nodes Lymphoid tissue.

Unit-IV

Urogenital System: Structure and function of kidneys, ureters, urinary bladder and urethra. General outline of male and female genital systems; Formation of semen: Structure of sperm.

Endocrine System: Different endocrine glands and their secretions. Neuro-endocrinal.

Unit-V ;

Nervous System: Various types of nerves and structure of different parts of the brain meninges and spinal cord: various somatic sensations: Neuromuscular junctions.

Special Sense Organs: Gross structure and function of eye, ear, nose and tongue.

Suggested Readings:-

- Sindair, D. An Introduction of Fundamental Anatomy, Blackwell Publications.
- Smout and Macdonald, Anatomy and Physiology, Edward Arnold.
- Tortorn and Grabowski, Principles of Anatomy and Physiology,Harper Catiins College
- Publishers.
- William P.L., Bannioter, LH., Berry, M.M. and Collins. P.Gray's Anatom. International Student's Edition.

HUMAN PYSIOLOGY

Unit-I

General Physiology: Functional organization of cells; structure of cell membrane and transport across membrane, Body fluid, Homeostasis.

Skin: Different mechanisms involved i in body temperature regulation. Pyrexia and Hypothermia, Sense receptors of skin.

Muscular System: Basis of muscle contraction; Duration curve; Starling law, Electrical - biphasic and monophasic action potential, chemical, thermal and physical changes. Isolmetric and isotonic contraction.

Unit-II

Blood: Composition, Physical properties and function of blood plasma Proteins and their Component. Thrombopoiesis, structure and function of Platelets, Physiology of Clotting and Fibrinolysis. Blood groups and Physiological basis of transfusion medicine.

CardiovascuJar System: General Introduction of Cardiovascular systems. Cardiac cycle and Heart sounds; Interpretation of normal Electrocardiogram; "Cardiac output and Cardiac failure: Venous return: Heart rate and its regulation, Structure and organization of vascular tree, Arterial blood pressure and pathophysiology of Hypertension, angina and infarction.

Unit-III

Digestive System: General principles of Gastro-Intestinal functions; Composition, Function and regulation of secretion of Saliva, Gastric Juice, Pancreatic juice, Succus entrucus and Bile; Movements of GIT: Digestion and absorption of fats, proteins and Carbohydrates, Functions of Liver and LFT.

Respiratory System: Functional anatomy of respiratory system . Mechanisms of breathing, Mechanisms of inspiration and Expiration, Intra-pleural & Intra- alveolar pressure,

Compliance Surfactant, Airway resistant and work of breathing respiratory membrane and diffusion of gases.

Pulmonary Circulation: Composition of Gases and Partial Pressure, Oxygen and Carbon-dioxide transport, Lung Volume; Capacities and Lung function tests; Nervous and Chemical control of breathing , Physio-Clinical aspects of Dysponea, Apnoea, Asphyxia, Hypoxia. Cyanosis. Breath holding High and Low atmospheric pressures,

Unit -IV .

Reproductive System: Sex determination and development of puberty male sex hormones and "their function: spermatogenesis, Female sex hormone and their function: menstrual cycle. ovulation and contraceptives, Pregnancy; function of placenta and lactation.

Excretory . System: Gross and minute structure of kidney; Features of rena! circulation, Mechanism ‘ot formation of urine ; Glomerular Filtration Rate and tubular function; Rena! function tests; Physiology of micturition.

Unit-V

Nervous System: Functioning. of Autonomic Nervous System; Higher neural regulation of Axial Neryous system.

Special Senses: Functional anatomy of the Eye; Optics of vision: Visuai pathways. Sens of hearing: Auditory pathway and Vestibular apparatus; Sense of Taste. Sense of smell.

Suggested Regarding:-

- Guyton, A.C. and Hall, J.E. Textbook of Medical Physiology; Harcourt Asia Pre. Lid. W.B. Saunders Company.
- Swash, M.Hutchision’s Clinical Methods, W.B. Saunders Company Limited,

BIOCHEMISTRY

Unit-I

Carbohydrates: classification, structure and function, Chemical & physical Properties and importance of starch, cellulose, glycogen and chitin. Carbohydrate metabolism; Glycolysis, TCA cycle, Electro transport chain, Metabolism of glycogen; Glycogenesis,Glycogenolysis, Metabolism of Galactose.

Unit-II

Protiens: structure classification, chemical bond involved in stability of protein structure. Protein configuration, Protein sequencing, peptide synthesis, biological role of proteins, Protein metabolism; transmination, deamination, urea cycle and metabolism of essential amino acids.

Unit-III

Lipids: classification, structure and properties. oxidanon of fatty acids: saturated and unsaturated fatty acids: ‘odd-and even-chain fatty acids: Biosynthesis of lipids and its regulation, biological role of lipids.

Unit-IV

Enzymes: ‘classification and nomenclature: mechanism of enzymes action: active site: enzyme, kinetics, enzyme inhibition. regulation of enzymes activity. allosteric enzymes Clinical applications of enzymes.

Unit-V

Hematology: Introduction: Specimen collection and processing for clinical chemistry. Clinical examination of blood, Blood collection methods of capillary puncture and vein puncture.

Haemocytometer, RBC, WBC and platelet counts; Blood cell morphology and differential count; Haemotologic test; Erythrocyte sedimentation rate;Principles of automated hematology; Hematocrit test; Bleeding disorder and its laboratory diagnosis; Blood – Bank and its management.

Suggested Readings:-

- Bhagvan N.V. Medical Biochemistry , Academic press
- Wilson, K, and Walker, J. Pracecat Biochemistry. Cambridge University Press.
- Chatterjeé, M. N. and Shinde, R. Textbook of Medical Biochemistry: Medical Publishers.
- Sachdev, K.N. Clinical Pathology and Clinical Bacteriology, Jaypee Brothers. Medical Publishers.
- Estridge, H. and Reynolds, W Wat Medical Laboratory Techniques,, Thomson DelmarLearning.
- Lehininger. N.D. and Cox. MLL. Principles of Biochemistry, Macmillan Worth Publishers

GENERAL MICROBIOLOGY

Unit-I

Discovery of Bacterial world: History of Microbiology; Scope and relevance of Microbiology; Role of microbes in disease. Current status of microbes in the living world. Hacckel's three kingdom concept. Whittaker five kingdom concept.Eight kingdom system of classification of Cavalier Smith: Classification of salient features of bacteria according to the Bergey's manual of Determination Bacteriology.

Unit-II

General account of Prokaryotes Size , Shape and arrangement of bacteria: Ultra- Structure of bacterial cell; Structure and function of Gram positive and Gram Negative cell wall , cell membrane, cytoplasmic matrix, inclusion bodies, mucoid, flagella, pili and endospores; Reproduction and recombination in Gram positive and Gram negative bacteria,

Unit -III

History and discovery of viruses, Nature of viruses: General characters of viruses: infection and replication. Nomenclature and classification of viruses; Purification and quantitative assays of viruses; Bacteriophage; Structure and life cycle pattern of T-even phage and X- phage

Unit –IV

General characters of Eukaryotic microbes; Ultra structure and typical and atypical eukaryotic cell; Classification of eukaryotic microbes. (Fungi, nematodes and Cestodes) Evolutionary relationship of each group on moderm system of classification; Sources of infection and their mode of transmission.

Unit –V

Physical, Chemical and biological hazard, Safety on microbiological Labs, quality assurance in microbiological laboratories; Hospital and laboratory waste disposal and management; Decontamination Antisepsis.

Unit-VI

Prenaration of culture media: Types of culture media: simple media. Complex media, synthetic media, enriched media, selective media, indicator media, differential media, anaerobic

media: sterilization and Disinfection; Pure culture techniques; streak plate, pour plate and spread plate method: Maintenance of pure culture; Methods of preservation of various microbes

Unit-VII

Introduction to Clinical Microbiology: Occurrence of infections of special concern routes in infections: Microbiological Safety cabinates; Handling of Hazardous materials.

Unit-VII

Microscopy: Specimen preparation and basic principles for the examination of microbes by light, phase – contrast, dark field, confocal, florescent and electron (transmission and scanning) Microscopy: Micrometery and microdensitometery. Chromatography (paper, thin layer column, preparation, gel filtration, ion – exchange and affinity chromatography): GLC and HPLC

Unit-IX

Principals and applications of Electrophoresis (one and two dimensional for proteins and DNA): iso-electric focusing; Autoradiography, Centrifugation Ultracentrifugation, Dialysis and ultrafiltration, Lyophilization in microbiological studies.

Unit-X

Fractionation of microbial cell: Separation of different cell organelles and chemical analysis of microbial cells for carbohydrate , proteins, amino cells, lipids and nucleic acids.

Suggested Readings:-

- Prescon : L.M. Harley, Land Klein, D. Microbiology, WCB Graw Hill
- Perry. J.J. and Staley, J.K. Microbiology, Dynamics and Diversity, Saunders college Publishing, Harcount Bracee College Publishers.
- Sehleged, H.G. Generab 'Microbiology. Cambridge Low price edition Cambridge university press.
- Pelezar,M.J.Chain, E.C.S. and Krieg, N.R. Microbiology, Tata Mc Graw-Hill publishing Company Limited, New Delhi.
- Wilson, K. and Walker, J. Practical Biochemistry: Principles and Techniques Cambridge Low price edition edition Cambridge university press.

IMMUNOLOGY

Unit-I

Introduction to the Immune system. Innate Immunity (Active and Passive). Anatomical, physiological phagocyte and inflammatory barriers, Adaptive immunity, natural and artificial immunity, cell involved in immune response; lymphoid linage (B lymphocytes & T lymphocytes) and Myeloid lineage (phagocytes; macrophages, neutrophils, eosinophils, basophils , must cells, natural killer cells & platelets) Cytokines; Interferons and Interleukins: Organs involved in immune system; primary and secondary lymphoid organs.

Unit-II

Antigens and immunogenicity; structure and general properties of antigens, preparation and

purification of antigen,types of antigens-haptens, super antigens; Closter of differentiation molecules (CDs); Antigen recognition molecules;Major histocompatability complex (MHC): T cell receptor and B cell receptor; Molecular features of Antigenic determinants.

Unit-III

Immunoglobulin: structure and type of immunoglobulins; Genetic diversity of immunoglobulins; Antigen-antibody intraction; Binding of immunoglobulins to antigen; B cell biology and T cell biology; Complement system.

Unit-IV

Immunoassays for diagnosis of infectious disease: Agglutination, Percipitation, Immunization, ' complement fixation, immuno-electrophoresis, Immuno-blotting, ELISA, RIA,, Fluorescencent antibody assay. Immunoelectron microscopy. Opsonization and Neutralization.

Unit-V

Immune system in healthly and diseased individual. Infections and vaccination, (Type of vaccine) and immunization of test animals, Monoclonal antibody and hybridona technology; Application of monoclonal antibodies, Immune rejection, Tumour Immunology, Immunodeficiency disorders and AIDS. Immunity to bacterial, viral, parasitic and fungal infections.

Suggested Readings:-

- Pier, Byezar and Wetzler, Immunology, Infection and Immunity, ASM press.
- Tizard, R.I. Immunology, An Introduction, Thomson press.
- Rose, Hamilton and Detrick Manual of Clinical Laboratory Immunology, ASM press.
- Lydyard P.M. Whelan, A., and Fanger, M.W. Instant Notes in Immunology, Viva Books Prt Ltd.

SYSTEMIC BACTERIOLOGY

Unit-I

Classification of medically important bacteria. Normal flora of human body and its importance. Commensals and Pathogenic microorganism; Culture and growth of bacteria; Morphological, Physiological and Biological Test for the identification of bacteria; Nosocomial infections; Antimicrobial susceptibility test; Genetic basis of drug resistance.

Unit-II

Important human infections caused by Gram-positive cocci, their pathogenesis, Lab diagnosis, prevention and control: Staphylococcus (Skin infections, Musculoskeletal, Respiratory, Central nervous system, Endovascular and Urinary infections, Toxic Shock Syndrome and Scalded Skin Syndrome), Coagulase negative Staphylococcus and Micrococcus, Streptococcus (Respiratory, skin and Genital Infections).other hemolytic and anaerobic Streptococci. Pneumococcus (Otitis media, Sinusitis, Pneumonia).

Unit-III

(A) Important human infections caused by Gram-positive cocci, their pathogenesis, Lab diagnosis, prevention and control: Neisseria (Meningitis,Septicemia Gonorrhea), Morexella.

(B) General characters, morphology, pathogenesis, lab diagnosis, prevention and control of diseases caused by; Mycoplasma (Pneumonic and Genital infections). Rekettsia (Typhus

fever and spotted fever). Chlamydia (Trachoma, Inclusion conjectivitis, Infant pneumonia), Spirochaetes (Syphilis), Actinomycetes, Nocardia.

Unit-IV

(A) Important human infections caused by Gram-negative bacilli, their pathogenesis, Lab diagnosis, prevention and control: e. g. Corynebacterium (Diphtheria), Bacillus (Anthrax, Food Poisining), Listeria (Literiosis), Clostridium (Gas gangrene, Food Poisoning and other infections tetanus).

(B) Important diseases caused by Mycobacterium (Tuberculosis, Leprosy), their pathogenesis, Lab diagnosis, prevention and control: Atypical Mycobacteria.

Unit-V

Important human infections caused by Gram-negative rods, their pathogenesis, Lab diagnosis, prevention and control: Escherichia coli, Klebsiella, Entrobacter, Proteus (Wound, Respiratory and Urinary infections), Salmonella (Enteric fever, Food Poisoning), Shigella (Bacillary dysentery), Vibrio (Cholera), Helicobacter (Campylobacter), Pseudomonas (Nosocominal infections), Haemophilus (Influenza, Meningitis, Bronchitis), Brucella (Brucellosis), Yarsinio (Plague),

Suggested Readings:-

- Ananthanarayan R. and Panikar, C.K.J. Textbook of Microbiology. Orient Longman Limited, Anna Salai, Chennai.
- Mackie and McCartney, Practical Medical Microbiology. Churchill Livingstone : Edinburgh London New York, Philadelphia Sydney Toronto.
- Jawetz, Melnick and Adelberg . Medical Microbiology, A LANGE Medical book, Mc Graw-Hill Publications.
- Elliott, T. Hasting, M. and Desscelberger, U. Lecture Notes on Medical Micrabiology, Blackwell Science.

VIROLOGY AND MYCOLOGY

Unit-I

Origin and development of concept of virology, Collection of clinical samples. Diagnosis technique for viral disease.Detection of viral antigens, nucleic acid and specific antibodies. Virus isolation by conventional and non conventional methods: monolayers, shell vials, lymphocyte cultures and animal and embrionated eggs.

Virus identification: Immunofluorescence, Immunoperoxidase test,Neutralization, Light microscopy and Electron microscopy.

Unit-II

Pathogenesis of viral infection, Host cell responses in viral infection: Interferon and Apoptosis: Replication of DNA and RNA viruses; Antiviral drugs and their mechanism of action; viral vaccines; Use of Bacteriophages in bacterial identification; Use of animal viruses as vectors.

Unit-III

(A) Struture, disease caused by, Laboratory diagnosis, prevention and control of DNA viruses. e.g. Poxvirus (Small pox. Cow pox. Molluscum Contagiosum), Herpesviruses (HSV-1, HSV-2, Varicella-Zoster, Cytomegalovirus, Epstein-Barr virus), Adenovirus, Hepadnavirus.

(B) Struture, disease caused by, Laboratory diagnosis, prevention and control of RNA viruses. e.g. Orthmyxoviruses (Influenza), Paramyxoviruses(Mumps, Measles, Respiratory Syncyual Virus), Picornaviruses (Enteroviruses, Rhinovirus), Human Retroviruses (HTLV-1. HTLV-2. HIV). Hepatitis Viruses.

Unit-IV

Viral zoonoses; Rabies: Hemorrhagic fevers, Yellow fever, Colorado tick fever, Vesicular Stomatitis, Viral Encephalitis (Japanese encephalitis, Venezuelan equine encephalitis, Eastern and Western equine encephalitis, St. Louis encephalitis, Murray valley encephalitis); Emerging and re-emerging zoonoses.

Unit-VI

Oncogenic viruses and human cancers; Burkitt's lymphoma, Nasopharyngeal carcinoma, T- cell leukemia, Hepatocellular carcinoma, Kaposi's sarcoma, Skin, Transplantation associated viral infections; Prions, Structure, replication and disease caused by them. Viroids, Emerging and re-emerging viral disease.

Unit-VII

Classification of Medically relevant fungi: Collection, storage and transport of clinical samples; Laboratory diagnosis of important fungal diseases; Serodiagnosis, Plating techniques. Culture media for fungi; Bird seed agar, Brian heart infusion agar, CHROM agar Candida dermatophyte test medium, Inhibitory mold agar, Mycosel agar, Yeast extract Phosphate agar, Sabouraud's dextrose agar; Antifungal Chemotherapy; Susceptibility tests; macro-dilution, micro-dilution, colorimetric method, Spectrophotometer method, agar diffusion method.

Unit-VIII

Dermatophytoses: Superficial mycoses (ringworm, superficial candidiasis, pityriasis, otomycosis, mycotic keratitis, superficial infections of, skin, 'nail and hair); subcutaneous mycoses (mycetoma, chromoblastomycoses, sporotrichosis), Systemic - mycosis (coccidioidomycosis, histoplasma, blastomycoses, paracoccidiodomycoses, cryptococcosis, rhinosporidiosis, aspergillosis, systemic candidiasis, zygomycosis, pneumocystosis. penicillosis mameffeil) Other opportunistic mycoses, mucor mycosis.

Unit- IX

Mycotoxicoses: Mode of action of aflatoxins,ochratoxins, trichothecenes, fumonisins, zearaleniones, patulin, penicillic acid and ergotoxins; Methods of detoxication; Prevention and treatment.

Suggested Readings:-

- Ananthanarayan, R. and Panikar, C.K. J, Textbook of Microbiology; Orient Longman Limited. Anna Salai 'Chennai.

- Jawetz, Melnick and Adelberg. Medical Microbiology, A LANGE Medical book, Mc Graw-Hill Publications.
- Knipe M, Hawley, M.P., Fields Virology, Lipponcott Williams & Wileins
- Murray, P.R., Baron, E.J., Pfaller, M.A., Tenover, F.C, and Yolken, R.H. Manual of C linical Micobiology, American Society for Microbiology. ASM press.
- Eds-Granoff, A. and Webster, R.G. Encylopedia of Virology, Academic press, USA

PARASITOLOGY

Unit-I

General Parasitology, Classification, pathogenesis, Laboratory diagnosis, treatment and prevention of diseases caused by intestinal and urogenital protozoa e.g. Entamoeba, non pathogenic amoeba, opportunistic amoeba Giardia, Trichomonas. _ Chilomastix, Retortamonas, Dientamoeba Leishmania, Trypanosoma, Blantidium, malaria, Toxoplasma, Sarcocystis, Isospora, Cyclospora, Filaria. Balantidium, Microsporidia.

Unit-II

Introductions to Helminths , Classification, pathogenesis, Laboratory diagnosis, treatment and prevention of diseases caused by Cestodes or tapeworms, e. g. Taenia, Hymenolepis, Dipylidium, Echinococcus.

Unit-III

Introduction to Trematodes or Flukes, Classification, pathogenesis, Laboratory diagnosis, treatment and prevention of diseases caused by Trematodes , e.g. Schistosoma, Paragonimus, Fasciola, Clonorchis Paragonimus, Gastrodiscoides, Watsonius, Opisthorchis. Heterophyes. Metagonimus.

Unit-VI

Introduction to Nematodes, Classification, pathogenesis, Laboratory diagnosis, treatment and prevention of diseases caused by Nematodes , e.g. Trichinella, Tricuris, Strongylodes, Ancylostoma, Necator americanus, Enteribius, Ascaris, Ancylostoma, Wochereria, Brugia, loa loa, onchocerca, Mansonella, Dirofilaria, Dracunculus, Angiostrongylus, Gnathostoma.

Unit-VI

Detection and Identification of parasite: Examination of stool, intestinal contents, urine, sputum. Aspirates, Cerebrospinal fluid, Biopsy material and blood; Antiparasitic agents and susceptibility testing, Parasitic opportunistic infections in AIDS cases and Nosocominal Parasitic infections, Recent advancements in parasitology.

Suggested Readings:-

- Arora D.R. Medical Parasitology, CBS Publications, New Delhi.
- Truant L.A. Mannual of Commercial methods in clinical Microbiology, ASM press.
- Murray, P.R. Baron,E.J.Pfaller, M>A. Tenover, F.C. and Yolken, R.H. Manual of Clinical Microbiology, American Society for Microbiology, ASM press:
- Elliott, T., Hasting, M. and Desselberger, U. Lecture Notes on Medical Microbiology, Blackwell Science.
- Jawetz, Melnick and Adelgerg's, Medical Microbiology, Mc Graw Hill Publishers.

CLINICAL MICROBIOLOGY & RECENT ADVANCEMENT

Unit-I

Collection, transport and storage of clinical specimen: Specimen processing (Bacteriology, Virology, Mycology and Parasitology), Prevention and contro! of laboratory acquired infections. Identification of Microorganisms, Defferent staining techniques simple, Gram's staining. Ziehl-Neelson method for AFB, Albert staining, Flurochrome staining, Leishman's staining, Giemsa' s Staining and special method to demonstrate granules capsule and endspores.

Unit-II

Laboratory diagnosis of diarrhea, dysentery, food poisoning, Sore-throat, pyrexia of unknown infections. STD, UTI, RTI and upper respiratory infections.

Unit-III

Hemoglobin estimation: Blood collection; capillary puncture, venipuncture; White blood cells (WBC), Red blood cells (RBC) and Platelet count; Preparation of peripheral blood smear; staining and Differential Leucocytes Count (DLC), total leucocytes count (TLC); Erythrocyte Sedimentation Rate (ESR), Packed cell Volutie (PCV), Mean Corpuscular Haematocrit. And Absolute values; Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH). Mean Corpuseular Hemoglobin Concentration (MCHC), Blood grouping.

Unit-IV

Clinical pathology: physical, chemical and microbiological examination of urine, stool, CSF and blood culture; Semen analysis; Pregnancy test and throat swab culture.

Unit-V

Infection in clinical practice: Infections of the Skin and tissues, Respiratory tract, Gastrointestinal tract, genitourinary tract, Central nervous system and Bone and Joints, Congenital and Neonatal infections, Hospital acquired infections, Immune Compromised patients infections.

Unit-VI

Nucleic acids as genetic information carries, DNA structure, types of DNA, DNA replication in prokaryotes & eukaryotes, Structural features of RNA (mRNA, tRNA, rRNA). Transcription in prokaryotes & eukaryotes.

Unit-VII

Regulation of gene expression, Basic features of the generic code. Protein synthesis in prokaryotes and eukaryotes. Recombination; general principles, Plasmids (types of plasmids-F plasmids, R plasmids, Col plasmids, Ti plasmid and others). Gene transfer mechanisms transformation, transduction, and conjugation.

Unit-VIII

Mutations; spontaneous mutation, Induced mutagenesis mutagens (Physical mutagens-non ionization radiation, Chemical mutagens: Base analogues, alkylating agents, intercalating agents, & others), Molecular mechanism of mutagenesis. DNA repair mechanism, repair by direct reversal. Excision repair, recombinational repair & SOS repair.

Unit-IX

Basic steps of r-DNA technology; Restriction endonucleases. Cloning vectors: general properties, plasmids, bacteriophages. cosmids, shuttle vectors, bacterial artificial chromosomes. Eukaryotic cloning vectors for yeast, & animal cells. Gene libraries: genom, library (Shot gun approach), cDNA library (different methods for synthesizing cDNA molecules.

Unit-X

Molecular Techniques; Principles, methods &. their applications in medical diagnosis- such as PCR. 'Southern Blotting, Northern~Blotting, RELP, RAPD, Western Blowing. DNA finger

printing and DNA sequencing: Microbial genetic & design of vaccines. for TB & leprosy. DNA vaccines design & advantages Recombination vaccines.

Suggested Readings:-

- Murray P.R., Baron, E.J., Pfaller, M.A., Tenover, F.C. and Yolken, R.H., Manual of
- Clinical Microbiology, American Society for Micorbiology, ASM press.
- Fleming, D.O. Ricjardson. J.H.Tulis, J.J. and Vesley, D. Laboratory Safety Principles
- And practices ASM press, Washington D.C.
- Truonts, AL, Manual of Commercial Methodes in Clinical Microbiology, ASM press, Washington D.C.
- Estridge B.H., Revnolds. A.P. and Walters, N.J. Basic Medical Laboratory technique, Dalmar, Thomson Learning.
- Lewin B. Genes VH. Persons Prentine Hall Oxford University Press.
- Frefilder, D. Microbial Genetics, Narosa Publishing House.
- Gupta P.K.Cell and Molecular Biology, Rastogi Publication.
- Singh. B.D. Genetics. Kalyani Publication.
- Brown,'T.A. Gene Cloning and DNA analysis an introduction, Blackwell Science.
- Old, R. W. and Primrose, S, B, Principles of Gene Manipulation, Blackwell Science.
- Singer, M and Berg P. Gene and Genome, University Science Book

NETAJI SUBHASH CHANDRA BOSE SUBHARTI MEDICAL COLLEGE, MEERUT