

  
**KANNUR UNIVERSITY**

(Abstract)

**M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programmes under Choice Based Credit Semester System in the University Department- Revised Scheme, Syllabus & Model Question Papers Implemented with effect from 2015 admission- Orders issued.**

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**ACADEMIC 'C' SECTION**

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U.O. No. Acad/C4/ 9343/2015

Civil Station P.O, Dated, 15-12-2015

- Read:
1. U.O No. Acad/C3/2049/2009 dated 11.10.2010.
  2. U.O No. Acad/C3/2049/2009 dated 05.04.2011.
  3. Meeting of the Syndicate Sub-Committee held on 16.01.2015.
  4. Meeting of the Curriculum Committee held on 10.04.2015.
  5. U.O No. Acad/C4/14536/2014 dated 29.05.2015.
  6. Meeting of the Department Council held on 15.06.2015.
  7. Letter from the Director, School of Health Sciences, Thalassery Campus, Palayad.
  8. Meeting of the Curriculum Committee held on 03.09.2015.

**ORDER**

1. The Regulations for Post Graduate Programmes under Choice Based Credit Semester System were implemented in the Schools/Departments of the University with effect from 2010 admission as per the paper read (1) above and certain modifications were effected to the same vide paper read (2).
2. The meeting of the Syndicate Sub-Committee recommended to revise the Scheme and Syllabus of all the Post Graduate Programmes in the University Schools/Departments under Choice Based Credit Semester System (CCSS) with effect from 2015 admission vide paper read (3) above.
3. As per the paper read (4) above, the meeting of the Curriculum Committee recommended certain modifications/ additions to the Regulations for Post Graduate Programmes under Choice Based Credit Semester System and the Regulations were modified in the University w.e.f. 2015 admission vide paper read (5).
4. The Department Council vide paper read (6) above has approved the Scheme, Syllabus & Model Question Papers for **M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programmes** under Choice Based Credit Semester System (CCSS) for implementation with effect from 2015 admission.
5. The Director, School of Health Sciences vide paper read (7) above, has forwarded the Scheme, Syllabus & Model Question Papers for **M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programmes** in line with the revised Regulations for Choice Based Credit Semester System for implementation with effect from 2015 admission.

P.T.O.

6. The meeting of the Curriculum Committee held on 03.09.2015 approved the Scheme; Syllabus & Model Question Papers for M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry / M.Sc. Medical Laboratory Technology under Choice Based Credit Semester System in the Department vide paper read (8) above.

7. The Vice Chancellor after considering the matter in detail, and in exercise of the powers of the Academic Council conferred under section 11(1) of KU Act 1996, and all other enabling provisions read together with, has accorded sanction to implement the Scheme, Syllabus & Model Question Papers for M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programme under Choice Based Credit Semester System, offered in the University Department w.e.f 2015 admission, subject to report to the Academic Council.

8. Orders are, therefore, issued accordingly.

9. The revised Scheme, Syllabus and Model Question Papers of M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programme effective from 2015 admission are appended.

Sd/-  
JOINT REGISTRAR (ACADEMIC)  
FOR REGISTRAR

To

The Director, School of Health Sciences  
Thalassery Campus, Palayad

Copy To:

1. The Examination Branch (through PA to CE)
2. PS to VC/PA to PVC/PA to R/PA to CE/PA to FO
3. JR/AR I Academic
4. The Computer Programmer (for uploading in the website)
5. SF/DF/FC

Forwarded/By Order

  
SECTION OFFICER

Bj



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# **KANNUR UNIVERSITY**



## **SCHOOL OF HEALTH SCIENCES**

**DEPARTMENT OF MEDICAL MICROBIOLOGY**

**REGULATION AND SYLLABUS FOR**

**M.Sc. MEDICAL MICROBIOLOGY PROGRAMME**

**UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM**

**(Applicable from 2015 Admission onwards)**

## **ELIGIBILITY FOR ADMISSION**

Candidates seeking admission to M.Sc. programme (Three yrs.) in Medical Microbiology should have passed Bachelors degree in any of the biological science subjects like Microbiology, Biochemistry, Zoology, Botany, Biotechnology, etc. or Chemistry with Biology as one of the subjects of study at degree /pre degree/higher secondary level securing not less than 60% marks or equivalent GPA in terms of marks secured in aggregate excluding languages/ common courses and open courses.

Candidates who have passed Bachelors degree (Four yrs.) in B.Sc. Medical Microbiology will be considered for direct admission to Two year. M.Sc. programme in Medical Microbiology.

## **DURATION OF THE PROGRAM ME**

Course of study will extend over a period of three years for graduates who have undergone Three year B.Sc. programme. The first year course (2 semesters) will be introductory course in basic medical sciences viz. Human Anatomy, Human Physiology and Biochemistry. The candidates gaining admission to Two yrs. programme will be directly admitted to second year (Part II) of the M.Sc. degree course exempting them from undergoing the first year (2semesters) course.

The minimum duration for completion of a two year PG Programme is four Semesters. The maximum period for completion is eight (8) Semesters. The minimum duration for completion of a three year PG Programme is six (6) Semesters. The maximum period for completion is twelve (12) Semesters. Even if a candidate earns the required number of credits in less than 4/6 Semesters, he/she has to necessarily study for four Semesters of the two year PG Programme and for six (6) Semesters for a three year PG Programme.

## **MODE OF SELECTION**

As per the Regulations prescribed by the University from time to time

## COURSE STRUCTURE

**MSc. MEDICAL MICROBIOLOGY (FACULTY OF MODERN MEDICINE)**  
SEMESTER WISE DISTRIBUTION OF COURSES, CONTACT HOURS, MARKS AND CREDITS  
 (EFFECTIVE FROM 2015 ADMISSION)

### Part I Semester I

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	SHS C 101	Fundamentals of Human Anatomy I	4	2	-	60	40	100	4
2	SHS C 102	Fundamentals of Human Physiology I	4	2	-	60	40	100	4
3	SHS C 103	Basic Biochemistry I	4	2	-	60	40	100	4
4	SHS P 104	Fundamentals of Human Anatomy I Practicals & Viva-voce	-	-	6	60	40	100	3
5	SHS P 105	Fundamentals of Human Physiology I Practicals & Viva-voce	-	-	6	60	40	100	3
6	SHS P 106	Basic Biochemistry I Practicals & Viva-voce	-	-	6	60	40	100	3
<b>Total</b>			12	6	18	360	240	600	21

## Part I Semester II

Sl.No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	SHS C 107	Fundamentals of Human Anatomy II	4	2	-	60	40	100	4
2	SHS C 108	Fundamentals of Human Physiology II	4	2	-	60	40	100	4
3	SHS C 109	Basic Biochemistry II	4	2	-	60	40	100	4
4	SHS P 110	Fundamentals of Human Anatomy II Practicals & Viva-voce	-	-	6	60	40	100	3
5	SHS P 111	Fundamentals of Human Physiology II Practicals & Viva-voce	-	-	6	60	40	100	3
6	SHS P 112	Basic Biochemistry II Practicals & Viva-voce	-	-	6	60	40	100	3
Total			12	6	18	360	240	600	21

## Part II Semester I

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MMB C113	General Microbiology	4	1	-	60	40	100	4
2	MMB C114	Systematic Bacteriology-I	4	1	-	60	40	100	4
3	MMB C115	Biomedical Instrumentation & Research Methodology	4	1	-	60	40	100	4
4	MMB P116	General Microbiology- Practicals & Viva-voce	-	-	6	60	40	100	3
5	MMB P 117	Systematic Bacteriology -I practicals & Viva-voce	-	-	6	60	40	100	3
6	MMB P 118	Biomedical Instrumentation & Research Methodology - Practicals & Viva-voce	-	-	6	60	40	100	3
7	MMB E 119	Elective 1*	3	1	-	60	40	100	3
Total			15	4	18	420	280	700	24

## Part II Semester II

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MMB C120	Systematic Bacteriology-II	4	1	-	60	40	100	4
2	MMB C121	Virology&Mycology	4	1	-	60	40	100	4
3	MMB C122	Immunology	4	1	-	60	40	100	4
4	MMB P 123	Systematic Bacteriology-II practicals & Viva-voce	-	-	6	60	40	100	3
5	MMB P124	Virology&Mycology practicals & Viva-voce	-	-	6	60	40	100	3
6	MMB P 125	Immunology Practicals & Viva-voce	-	-	6	60	40	100	3
7	MMB E126	Elective 2*	3	1	-	60	40	100	3
<b>Total</b>			15	4	18	420	280	700	24

## Part II Semester III

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MMBC127	Parasitology & Entomology	4	1	-	60	40	100	4
2	MMBC128	Molecular Biology & Medical Genetics	4	1	-	60	40	100	4
3	MMBP129	Parasitology & Entomology Practical&Viva-voce	-	-	6	60	40	100	3
4	MMBP130	Molecular Biology & Medical Genetics Practical&Viva-voce	-	-	6	60	40	100	3
5	MMBE131	Elective 3*	3	1	-	60	40	100	3
6	MMBE132	Elective 4*	3	1	-	60	40	100	3
7	MMBC133	Internship	-	6	-	60	40	100	3
<b>Total</b>			14	10	12	420	280	700	23

## Part II Semester IV

Sl. No	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MMBC134	Clinical Microbiology	4	2	-	60	40	100	4
2	MMBC135	Diagnostic Microbiology	4	2	-	60	40	100	4
3	MMBP136	Clinical Microbiology Practicals & Viva-voce	-	-	6	60	40	100	3
4	MMBP137	Diagnostic Microbiology Practicals & Viva-voce	-	-	6	60	40	100	3
5	MMBC138	Research Project	-	12	-	120	80	200	10
<b>Total</b>			8	16	12	360	240	600	24

### ELECTIVES

1. FOOD & DAIRY MICROBIOLOGY
2. HEAMATOLOGY AND CLINICAL TECHNIQUES
3. BASIC NUTRITION
4. NON- COMMUNICABLE DISEASES
5. EPIDEMIOLOGY AND CONTROL OF INFECTIOUS DISEASES
6. GENERAL PATHOLOGY
7. PHARMACEUTICAL MICROBIOLOGY



## SCHEME OF EVALUATION

Evaluation shall be done on the basis of continuous evaluation and end semester examination. The proportion of the distribution of marks among ESE and CE shall be 60:40.

Distribution of marks for Theory, Practicals & Viva voce (Core & Elective)

	End Semester Examination	Continuous Evaluation	Total
Theory	60	40	100
Practicals*	30	20	100
Viva-voce*	50	-	
Grand Total	140	60	200

\*Practicals and viva-voce component is only for Core paper

Continuous evaluation of the course shall be based on periodic written tests, seminars, assignments and attendance in respect of theory courses and based on tests, lab skill and attendance in respect of practical courses. The percentage of marks assigned to various components for continuous evaluation is as follows.

Weightage to the components of internal marks

### **Theory**

1. Test papers - 40%
2. Seminars - 20%
3. Assignment - 20%
4. Attendance - 20%

### **Practicals**

1. Tests - 50%
2. Lab skills - 30%
3. Attendance - 20%

### **Test papers**

At least three class tests will be conducted during a semester. Best of the marks obtained in the two tests will be counted.

### **Seminar**

Each student shall deliver one seminar as an internal component of each course

### **Assignments**

Each student shall be required to do at least 2 assignments for each course.

### **ATTENDANCE**

The minimum attendance required for each course shall be 75% of the total number of classes conducted for that semester. Those who secure the minimum attendance in a semester alone will be allowed to register for the End Semester Examination. Condonation of attendance to a maximum of 10 days in a Semester subject to a maximum of two spells within a Programme will be granted by the Vice-Chancellor. Benefit of Condonation of attendance will be granted to the students on health grounds, for participating in University Union activities, meetings of the University Bodies and participation in extracurricular activities on production of genuine supporting documents with the recommendation of the Head of the Department concerned. A student who is not eligible for condonation shall repeat the course along with the subsequent batch.

### **CONDUCT OF END SEMESTER EXAMINATION**

Pattern of Double valuation will be followed for Choice based Credit Semester System

The Head of the Department will have to submit to the Controller of Examinations, the details of the Core and Elective of each semester along with the syllabus, Model Question Papers and Panel of Experts for setting the questions, immediately after starting of each semester. The Controller of Examinations in turn shall set, print and supply one set of question paper in sealed cover to the Head of the Dept./ Course Director within a maximum of 60 days.

Viva voce examination of II semester will cover all the papers both theory and practicals of I and II semesters. Viva Voce examination at the end of IV semester will cover all the papers, both theory and practical of III and IV semester.

### **PATTERN OF QUESTIONS**

For the end semester examination each question paper shall consists of three sections:

Section A, B and C carrying a total of 60 marks

Section A consists of two essay type questions, each carrying 10 marks.

Section B consists of five short note questions, each carrying 5 marks.

Section C consists of five brief note questions, each carrying 3 marks.

### **PROJECT WORK**

Written account of the project shall be submitted by the students with in prescribed time before registering for IV semester (part II) examination.

The evaluation of the project will be on the following basis.

Project content	-	60marks
Presentation	-	30marks
Defence/Viva voce	-	30marks
Continuous evaluation	-	80 marks
Total	-	200 marks

Students scoring less than 50% (100 out of 200) marks in project evaluation shall be required to re submit and re appear for project evaluation.

Students failing to secure pass in any paper (Theory& practicals) shall reappear for that paper/those papers in subsequent semester examination. Students who fail to secure pass in Part I (preliminary- I years examination) shall not be permitted to register for Part II final semester (semester IV) examination. Students will be permitted to appear for project evaluation only after appearing for all the examinations in part I &II

## GRADING

1. An alphabetical grading system shall be adopted for the assessment of a student's performance in a Course. The grade is based on a 6 point scale. The following table give the range of marks %, grade points and alphabetical grade.

Range of Marks%	Grade Points	Alphebetical Grade
90-100	9	A+
80-89	8	A
70-79	7	B+
60-69	6	B
50-59	5	C
BELOW 50	0	F

2. A minimum of grade point 5 (Grade C) is needed for successful completion of a course.

3. Performance of a student at the end of each semester is indicated by the Grade Point Average (GPA) and is calculated by taking the weighted average of grade points of the courses successfully completed. Following formula is used for the calculation. The average will be rounded off to two decimal places.

$$\text{GPA} = \frac{\text{Sum of (grade points in an average multiplied by its credit)}}{\text{Sum of credits of courses.}}$$

4. At the end of the programme, the overall performance of a student is indicated by the Cumulative Grade Point Average (CGPA) and is calculated using the same formula given above.

5. Emperical formula for calculating the percentage of marks will be  $\text{CGPA} \times 10 + 5$ .

6. Based on the CGPA overall letter grade of the student shall be in the following way.

CGPA	Overall Letter Grade
8.5 and above	A+
7.5 and above but less than 8.5	A
6.5 and above but less than 7.5	B+
5.5 and above but less than 6.5	B
4.5 and above but less than 5.5	C

## 7. Conversion of Grades into Classification

<b>Overall Letter Grade</b>	<b>Classification</b>
A+ and A	First class with Distinction
B+ and B	First Class
C	Second Class

8. A student who has failed in a course can reappear for the End Semester Examination of the same course along with the new batch without taking re-admission or choose another Course in the subsequent Semesters of the same Programme to acquire the minimum credits needed for the completion of the Programme.
9. Appearance for Continuous Evaluation (CE) and End Semester (ESE) are compulsory and no Grade shall be awarded to a candidate if he/she is absent for CE/ESE or both.
10. A student who fails to complete the Programme /Semester can repeat the full Programme/Semester once, if the Department Council Permits to do so.
11. There shall not be provision for improvement of CE and ESE.
12. No student shall be allowed to take more than eight/twelve consecutive Semesters for completing a four /six Semester Programme from the date of enrollment.
13. Ranking will be confined to only those students who qualify all the examinations in first attempt. Only marks of the Part II examinations will be considered for classification and ranking.
14. No Candidate shall be permitted to work outside the institution while studying the course.

## **GRIEVANCE REDRESSAL MECHANISM**

Committees will be constituted at the Department and University levels to look into the written complaints regarding Continuous Evaluation (CE). Department Level Committee (DLC) will consist of the Department Council and student nominee of the Department Students' Union from the concerned Faculty.

University Level Committee (ULC) will consist of the Pro – Vice-Chancellor (Chairman & Convenor), the convenor of the Curriculam Committee(Vice-Chairman), the Head of the Department concerned and a nominee of the students' Union. Department Level Committee will be presided over by the HOD and University Level Committee by the Pro- Vice Chancellor. Department Level Committee will have initial jurisdiction over complaints against Continuous Evaluation and University Level Committee will hear appeals against Department level decisions. Complaints will have to be submitted to the Department concerned within two weeks of publication of results of Continuous Evaluation (CE) and disposed of within two weeks of receipt of complaint. Appeals to University Level Committee should be made within one month of the decisions taken by Department level Committee and disposed of within two months of the receipt of the complaint.

Complaints unsolved by the University level Grievance Committee shall be placed before the Vice Chancellor.

## **M.Sc. MEDICAL MICROBIOLOGY**

### **PART I – SHS C 101 – FUNDAMENTALS OF HUMAN ANATOMY I**

#### **THEORY**

##### Unit I

###### General Anatomy

Nomenclature and Terminologies in Anatomy

Cell- membrane, cytosol , organelle and inclusion bodies.

Tissues-

Epithelial tissue and glandular epithelia

Connective tissue

Muscular tissue

Nervous tissue

Blood vessels

Lymphoid tissue

Joints-Classification

Genetics and Embryology

Cell division, genome, DNA, Chromosomal anomalies, Chromosomal analysis

Gametogenesis- oogenesis,spermatogenesis,spermatogonia,menstrual cycle

Placenta-functions

##### Unit 2

###### Gross Anatomy

Classification of Bones

Upperlimb-Osteology of upper limb bones

Important muscles of upper limb.-Pectoralis major, Trapezeius, deltoid, biceps brachi, triceps brachi, supinator, pronator teres, name muscles of thenar and hypothenar eminence.

Joints- shoulder, elbow, wrist. Clinical aspects

Blood vessels-Cephalic vein, median cubital vein, axillary artery, brachial artery, radial artery and Clinical aspects

Nerves- Bracheal plexus-axillary, median ,ulnar, radial nerves and clinical importance

##### Unit 3

Lower limb- osteology of lower limb bones

Important muscles- gluteus maximus, quadriceps femoris, hamstring muscles, soleus and clinical importance

Joints-hip, knee, ankle and Clinical aspects

Nerves- Sacral plexus-Femoral and sciatic nerves and its Clinical aspects

Blood vessels- great saphenous vein, Femoral artery, dorsalis pedis

#### Unit 4

Thorax –osteology of ribs, thoracic vertebrae

Muscles- intercostal muscles

Pleura, lungs

Mediastinum- pericardium,heart, aorta, superior venacava, inferior venacava, azygos vein.

Nerve-intercostal nerve

### **PRACTICALS - SHS P 104 FUNDAMENTALS OF HUMAN ANATOMY I**

#### Micro Anatomy practicals

1. Simple compound microscope
2. Epithelium- classification
3. Connective tissue –collagen, elastic and reticular fibres and cells
4. Cartilage- hyaline, elastic, fibrous
5. Bone- compact bone T.S and L.S
6. Muscular tissue- skeletal, smooth and cardiac
7. Nervous tissue- neuron, c.s of peripheral nerve, spinal and motor ganglia.
8. Vascular tissue- medium sized artery , large artery, large vein.
9. Lymphoid tissue- lymph node, spleen, tonsil, thymus.
10. Gross Anatomy- Demonstration of dissection and prosection of human body including osteology relevant to the topics dealt in Lecture classes. Surface Anatomy. Discussions with the help of maps and models.



## **PART I – SHS C 102 – FUNDAMENTALS OF HUMAN PHYSIOLOGY I**

### **THEORY**

#### Unit I

Introduction to Human Physiology

#### Unit II

##### Circulatory System

Composition and functions of blood and plasma

RBCs – Structure – functions, properties

PCV, E.S.R, Osmotic fragility, Normal Count, Variations

Regulations of haemopoiesis – Life span – Deficiency disorders.

WBC – Morphology – Normal values – Classification of WBCs – functions

Life span – disorders of WBC functions.

Platelets – Structure – Normal values – properties and functions– Abnormalities

Blood volume – Normal value – Abnormalities

Tissue fluid: Formation – Starling Hypothesis-Lymph formations, Circulation, functions, oedema

Blood groups: Discovery – Landsteiners law –

ABO system – method of determination – Inheritance.

Rh. system – Blood group incompatibility disorders

Other blood group systems.

#### Unit III

##### Cardiovascular system:

Functional Anatomy of heart and blood vessels –

Properties of Cardiac muscle

Conducting system of heart – Origin and spread of Cardiac impulse – Cardiac Cycle – Pressure changes, heart sound

Cardiac output – Definition – normal value – method of measurement – Heart rate and its regulation.

Blood pressure – normal values and variations.

Regulation of blood pressure – measurement of B.P

Normal ECG

#### Unit IV

##### Respiratory system

Introduction – Functional anatomy of respiratory tract

Mechanism of respiration-movements,muscles,pressures,resistance,compliance

Lung volumes and capacities-Spirometry

Transport of gases-oxygen and carbondioxide

Regulation of respiration-Nervous and Chemical

– centers controlling respiration – Chemical control of respiration – chemical stimuli – Chemo receptors – Peripheral and Central mechanisms

Hypoxia – clinical features – therapeutic procedures

#### Unit V

##### Nerve-Muscle Physiology

Nerve cells-structure, properties and function

Synapse-properties and functions

Skeletal muscle – Contractile proteins – properties of skeletal muscle.

Cardiac muscle – mechanism of contraction

Smooth muscle – Properties and mechanism of contraction – Neuromuscular function.

#### Unit VI

##### Nervous system

Receptors, classification-Sensations; Touch, Pain and Temperature

Reflexes-reflex arc, properties of reflexes, mono and polysynaptic reflexes,

Stretch reflex, Withdrawal reflex

Spinal cord-Sensory and Motor tracts

Cerebral cortex-characterestic areas and functions

EEG: Methods of recording – clinical use.

### **PRACTICALS - SHS P 105 – FUNDAMENTALS OF HUMAN PHYSIOLOGY I**

1. Study of Microscope
2. Determination of total Erythrocyte (RBC) count, Determination of total Leucocyte (WBC) count : [TLC]. Estimation of Haemoglobin (Sahli's method). Preparation of peripheral blood smear and determination of differential Leucocyte count : [DLC]
3. Determination of Bleeding time [BT], Clotting time [CT], ESR and PCV
4. Determination of Blood groups [A,B,O and Rh system]

## **PART I – SHS C 103 - BASIC BIOCHEMISTRY I**

### **THEORY**

#### Unit I

##### Cell and Biological Membranes

Structure and functions of eukaryotic cells and organelles, molecular organization of cells, lipid bilayers, micelles and liposomes, lipid mobility, fluidity and asymmetry, membrane proteins, membrane structure and assembly, Fluid-Mosaic model, membrane transport, endocytosis and exocytosis, Gibbs Donnan membrane phenomenon, membrane potentials and action potential, single channel conductance.

#### Unit II

Lymph, tissue fluids and physical aspects

Blood cells, properties and functions. Blood volume and its regulation. Colloids, Diffusion, Partition, Law of Mass action, Surface tension, Adsorption, Viscosity, Osmotic pressure, Donnan membrane equilibrium and their applications.

#### Unit III

##### Carbohydrates

Definition, structure, properties and biological importance of monosaccharides, disaccharides and polysaccharides like glucose, fructose, mannose, ribose, xylose, galactose, lactose, maltose, sucrose, starch, glycogen, dextrans, and cellulose, deoxy sugars, amino sugars, uronic acids, heteropolysaccharides and glycosamino-glycans and proteoglycans, cell membrane, cell surface and serum glycoproteins, glycosylated proteins, carbohydrates of blood group antigens, sialic acid etc. Role of carbohydrates in cell recognition, and cell to cell interactions and communications, lectins.

#### Unit IV

##### Lipids

Classification of lipids, definition structure, properties and biological significance of fatty acids, triacyl glycerols, phospholipids, glycolipids, plasma lipids and lipoproteins, and cell membrane lipids, structure, biological significance and properties of cholesterol, bile acids, vit. D and steroid hormones. structure, properties and biological significance of poly unsaturated fatty acids and eicosanoids-prostaglandins, prostacyclins, thromboxanes, leukotrienes and lipoxins, action of non-steroidal anti-inflammatory drugs.

## Unit V

### Proteins

Definition, structure, properties and classification of amino acids, Structure, properties, classification, and functions of proteins . primary structure, Ramachandran plot and secondary structures- $\alpha$ - helix and  $\beta$ -sheet  $\beta$  turns and bends random coils, hairpin loops and other non repetitive structures, structure of insulin, myoglobin, hemoglobin and hemoglobin derivatives, myosin and actin, structure of silk fibroin,  $\alpha$ -keratin and collagen triple helical structures, supersecondary structures (motifs), tertiary and quaternary structures of proteins, forces that stabilize protein structure, denaturation, coagulation and precipitation of proteins, separatory techniques of proteins, methods to determine the molecular weight of proteins.

## Unit VI

### Enzymes

Definition and general properties of enzymes, IUB classification and nomenclature, enzyme specificity, active site and enzyme-substrate complex, factors governing the rate of enzyme catalyzed reactions, chemical kinetics-zero order, first order and second order reactions and activation energy, enzyme inhibitions, catalytic mechanisms of enzymes - acid - base, metal ion, covalent and electro static catalysis, enzyme regulation, covalent modifications, zymogen activation, induction and repression, coenzymes, cofactors and prosthetic groups, isoenzymes, abzymes, ribozymes. units of enzyme activity.

## Unit VII

### Nucleic Acids

Structure and properties of purine and pyrimidine bases, definition, structure, properties and functions of nucleosides, nucleotides and nucleic acids. structure and functions of DNA , denaturation and renaturation of DNA, polymorphic forms of DNA - A, B, C, D and Z DNA, nucleoproteins, structure, properties and functions of RNA - mRNA, rRNA, and tRNA.

## Unit VIII

### Porphyryns

Classification, structure and properties of hemes and cytochromes.

## Unit IX

### Acids, Bases, Buffers

Physical and chemical properties of water - ionization of water, acids and bases - definition, ionization and dissociation constants, pH, buffers and buffering capacity, blood buffers and other biological buffers, Henderson - Hasselbach equation, indicators and pH papers, principle, instrumentation and applications of pH meters and ion selective electrodes.

## Unit X

### General Methodology

Preparation of cleaning solution for glassware cleaning and care of laboratory glasswares and instruments, calibration of pipettes and other volumetric apparatuses. Storage and handling of dangerous chemicals and reagents. Anticoagulants, preservation and preparation of anticoagulant bottles for blood collection for different parameters. Introduction to clinical laboratory procedures, organization of a clinical laboratory, the lay out and design, laboratory accidents and precautions, first aid in laboratory accidents, capillary and venous blood collection.

## Unit XI

### Basic Laboratory principles and procedures

Water specifications- distilled, double distilled and demineralized water, general and clinical laboratory supplies, volumetric equipments and their calibration, Beer-Lambert's laws of light absorption, general principles, instrumentation and applications of colorimetry.

## **PRACTICALS SHS P 106 BASIC BIOCHEMISTRY I**

Learn the technique of drawing blood from the vein of humans. Reactions of carbohydrates, proteins and non protein nitrogenous substances, identification of unknown substances of physiological importance, reactions of oils, steroids (Lieberman-Burchard reaction), salivary amylase action on starch. Verification of Beer Lamberts Law

## **PART I – SHS C 107– FUNDAMENTALS OF HUMAN ANATOMY II**

### **THEORY**

#### Unit I

##### Abdomen pelvis & perineum

Osteology- lumbar vertebrae

Muscles of anterior abdominal wall

Peritoneum- greater omentum, lesser omentum, mesentery.

Oesophagus, stomach, small intestine, large intestine .

Liver, extrabiliary apparatus, pancreas, spleen, supra renal gland

Portal vein, portosystemic anastomosis, thoracic duct.

Pelvic organs- urinary bladder , uterus, fallopian tube, ovary, rectum

Prostate, ejaculatory duct.

Perineum- anal canal, scrotum, testes, male urethra.

#### Unit II

##### Head and Neck

Briefly mention the osteology of skull, cervical vertebrae. Thyroid gland, parathyroid

Tongue, pharynx, larynx, trachea

Brain- its parts and spinal cord, cerebellum, ventricle of brain

Pituitary gland.

Blood vessels- subclavian artery, vertebral artery, circle of willis

Cranial nerves and spinal nerves

Eye ball

Ear

### **PRACTICALS - SHS P 110 FUNDAMENTALS OF HUMAN ANATOMY II**

1. Oesophagus, stomach, duodenum, jejunum, ileum, large intestine, liver, gall bladder, pancreas

2 . Uterus, ovary, c.s of vas deferens, testes, epididymis, spermatozoa

Kidney , ureter, urinary bladder

3 . Pituitary gland, thyroid gland, parathyroid, suprarenal gland.

Cerebrum, cerebellum, c.s spinal cord

4 . Gross Anatomy- Demonstration of dissection and prosection of human body including osteology relevant to the topics dealt in Lecture classes. Surface Anatomy. Discussions with the help of maps and models.

## **PART I – SHS C 108 – FUNDAMENTALS OF HUMAN PHYSIOLOGY II**

### **THEORY**

#### Unit I

##### Renal System

Introduction-Functional anatomy of renal system

Urine formation-structure of Nephron, Counter current system

Diuresis

General anatomy of urinary bladder, muscles and sphincters

Micturition-reflex control-voluntary control and higher control

Abnormalities of micturition

#### Unit II

##### Gastro-Intestinal System

Functional Anatomy of gastrointestinal tract

Physiological basis of mechanism of secretion – regulation

Salivary secretion – Composition of saliva and functions

Regulation of Salivary secretion

Gastric Secretion – Composition and functions of gastric juice – Mechanism and regulation of HCl secretion, Regulation of gastric secretion.

Pancreatic Secretion: Composition, mechanism of secretion and actions. Regulation of pancreatic secretion – Pancreatic function tests.

Liver: Functions of Liver – Composition of bile – Functions of bile – regulation of bile secretion  
gall bladder functions – regulation of gall bladder functions.

Movements of GIT – Peristaltic movements - Gastric movements – types and regulation

Small intestines – different parts – movements of small intestine – types of movements and their functions.

Large intestine and its function – Different parts Secretion of large intestine and its regulation-defecation

### Unit III

#### Reproductive System

Introduction: Sex organs – genetic basis of sex. Sex chromatin – role of sex hormones in sexual differentiation in foetal life

Abberations of sexual development

Gonadotropins, prolactin,

Reproduction in female, menstrual cycle, ovarian

Cycle, ovulation, ovarian hormones, uterine cycle, cervical cycle, vaginal cycle, regulation of menstrual cycle

Fertilisation, Physiological basis of Pregnancy, function of placenta, placental hormones, pregnancy tests, Physiological basis of contraceptive methods.

Reproduction in male: Spermatogenesis and its regulation – Testosterone – functions and regulation erection, ejaculation of semen – composition of semen.

### Unit IV

#### Endocrine system

Hormones and its mechanisms of action

Secretion, regulation and functions of Pituitary, Thyroid and Parathyroid glands

Endocrine functions of Pancreas

Adrenal cortex and Adrenal medulla

### **PRACTICALS - SHS P 111 – FUNDAMENTALS OF HUMAN PHYSIOLOGY II**

1. Determination of Platelet count,
2. Determination of Reticulocyte count
3. Determination of Absolute eosinophil count
4. Examination of Reflexes.
5. Measurement of Blood Pressure.
6. Tests for HCG in urine.
7. Demonstration of ECG, EEG



8. Clinical examination of Nervous System, including Cranial Nerves.
9. Clinical examination of Cardiovascular System.
10. Clinical examination of Respiratory system.

## **PART I – SHS C 109 - BASIC BIOCHEMISTRY II**

### **THEORY**

#### Unit I

##### Bioenergetics

Laws of thermodynamics, basic concepts of free energy change, coupling of endergonic and exergonic reactions, activation energy of reactions, enzymes and coenzymes involved in oxidation and reduction, redox potentials, respiratory chain-components, organization and functioning of electron transport chain and its role in energy capture, mechanism of oxidative phosphorylation, mitochondrial transport and shuttle systems, inhibitors of respiratory chain, high energy compounds, generation, effects and disposal of reactive oxygen species, antioxidants

#### Unit II

##### Metabolism of carbohydrates

Glycogenesis, glycogenolysis, glycolysis, TCA cycle, HMP shunt and uronic acid pathways, gluconeogenesis and their regulations. metabolism of galactose, fructose, metabolism of glucose in tissues like RBC, skeletal muscles (type I, II & III), cardiac muscles, adipose tissue, lens etc. Diabetes mellitus and related disorders, Glucose tolerance test – Procedure and interpretation.

#### Unit III

##### Metabolism of lipids

fatty acid oxidation, synthesis, elongation and desaturation of fatty acids, Ketone bodies formation and utilization, Metabolism of cholesterol, triacyl glycerols, phospholipids, lipoproteins, eicosanoids and glycolipids. role of adipose tissue in the metabolism. Disorders related to lipids

#### Unit IV

##### Metabolism of proteins and aminoacids

Intracellular breakdown of proteins and cathepsins, Body amino acid pool, inter organ transport of amino acids, Nitrogen balance . Deamination, decarboxylation, transamination and

transdeamination. Formation and Disposal of ammonia, Urea cycle , hyper ammonemias. Glycogenic and Ketogenic aminoacids. Metabolism of individual amino acids – glycine, methionine, cysteine, valine, leucine, isoleucine, phenyl alanine, tyrosine, tryptophan etc.formation and biological significance of specialized products from amino acids.

#### Unit V

##### Metabolism of nucleic acids

biogenesis, degradation and regulation of purines, pyrimidines and nucleotides

#### Unit VI

##### Metabolism of porphyrins

synthesis and degradation of hemes, integration of metabolism, regulation of mammalian fuel metabolism and their interrelationships, metabolism during starvation and diabetes.

#### Unit VII

##### Metabolism of xenobiotics

Mechanisms of detoxication, effects of drug metabolites and biological implications of drug and xenobiotic metabolism, metabolism of alcohol.

#### Unit VIII

##### Metabolism of Vitamins & Minerals

Definition, classification, chemical structure, biological functions, dietary sources, daily requirement, deficiency manifestations, toxicity and metabolism of vitamins. Sources, requirement, Physiological functions, absorption and excretion of minerals like sodium, potassium, calcium, magnesium, sulphur, iron, phosphorus, chloride, copper, zinc, manganese selenium, cobalt, iodine, fluoride, chromium and other trace elements, water metabolism, endocrine regulation of water and mineral metabolism.

#### Unit IX

Basics of Separation techniques

#### **PRACTICALS SHS P 112 BASIC BIOCHEMISTRY II**

Estimation of blood glucose, total cholesterol, total proteins(biuret), urea, creatinine, uricacid, Chromatographic separation for aminoacids, Analysis of normal (Organic + inorganic constituents) and abnormal constituents(Urinanalysis –Physical & Chemical) of urine

## **REFERENCES - ANATOMY**

1. Ross and Wilson-Anatomy and Physiology in Health & Diseases, Churchill Livingstone
2. Kyung Won Chung-Gross Anatomy, Board Review Series
3. Inderbir Singh-Text Book of Anatomy & Embryology, Jaypee Publishers
4. Tansey E.M- Gray's Atlas of Anatomy
5. Ranganathan -Human Anatomy
6. Johnson K.E. -Histology & Cell Biology, NMS, Williams and Wilkins
7. Cunningham's practical anatomy-3volumes
8. Clinically oriented anatomy by regions- R.Snell
9. Human embryology- I.B Singh
10. Human histology- I.B. Singh
11. Neuroanatomy-I.B.Singh.
12. Gray's Anatomy
13. Grants method of Anatomy
14. Grants Atlas of Anatomy

## **REFERENCES - PHYSIOLOGY**

1. Keele C.A., Neil.E. & Joels N.-Samson Wright's Applied Physiology, Oxford University Press
2. Ganong W.F. - Review of Medical Physiology, Appleton Lange
3. Green J.H.-Basic Clinical Physiology, ELBS (3rd edn)
4. Text book of Medical Physiology-Arthur.C.Guyton (11<sup>th</sup> edn)
5. Concise Medical Physiology – Sujith K. Choudhuri. (6<sup>th</sup> edn)
6. Essentials of Medical Physiology – Anil Bavan singh and Maha Pathra.
7. Review of medical Physiology – William F.Ganong (23<sup>rd</sup> edn)
8. Physiological basis of medical Practice – Best & Taylor
9. Applied Physiology – Samson Wright. (13<sup>th</sup> edn)
10. Text book of Medical Physiology-Prof. A.K.Jain
11. Essential Medical Physiology- Leonadr R.Johnson (3<sup>rd</sup> edn)
12. Essential of Medical Physiology- K.Sembulingams&Prema Sembulingam (4<sup>th</sup> edn)
13. Manual of Practical Physiology- A.K. Jain
14. Text book of Medical Physiology-Indu Khurana

## **REFERENCES - BIOCHEMISTRY**

1. West E.S, Todd W.R., Mason H.S. & Bruggen J.V. - Biochemistry, Oxford and IBH Pub.Co. Pvt.Ltd.
2. Stryer L. -Biochemistry, W.H. Freeman and Co.
3. Nelson Nelson D.L. & Cox. M.M Lehinger's Principles of Biochemistry, Mc Millan Worth Publishers.
4. Voet, D. & Voet, J.G. Biochemistry John-Wiley & Sons.
5. Debajyoti Das-Biochemistry, Academic Pub.
6. Conn E.E. & Stumpf P.K. -Outlines of Biochemistry, Wiley Eastern
7. Boyer D. -Concepts in Biochemistry, Brook Cole Thomson Learning
8. Zubay G. -Biochemistry, Vol. I, II& III, WCB Pub.
9. Smith E.L. Hill R.L. Lehman I.R. Lefkowitz R.Z, Handler P. and White A.-Principles of Biochemistry, Vol. I & II, Mc Graw Hill International
10. Mazur A. and Harrow B. A Text Book of Biochemistry, Saunders
11. Mathews C.K, van Holde K.E. Ahern K.G.-Biochemistry Pearson Education Asia Pte. Ltd.

## PART-II MMB C 113 - GENERAL MICROBIOLOGY

### THEORY

#### Unit 1

Introduction

History – milestones in the development of Microbiology. Scope and application of Microbiology. Microscopes of all kinds. Definition, Taxonomy and classification of microorganisms.

#### Unit 2.

Prokaryotes and eukaryotes

Ultra structure of a bacterial cell. Morphology of bacteria – motility in microorganisms. Microscopic examination of bacteria and other microorganisms.

Staining methods – principles and applications.

#### Unit 3

Growth and nutrition of microorganisms – factors influencing the growth of microorganisms - Growth curve of bacteria and its significance. Cultivation of microorganisms - Culture media – classes and applications. Isolation of microorganisms in laboratory. Procedures for the identification of microorganisms, Bacterial counting methods.

#### Unit 4

Sterilisation, disinfection and antisepsis. Methods, principles and applications. Anti microbial agents, major classes and mechanisms of action. Disinfectants, mechanism of action and standardization. Antibiotic sensitivity tests, MIC, MBC. Antibiotic resistance pattern.

#### Unit 5

Microbial metabolism.

#### Unit 6

Microbial infection, modes of transmission of microorganisms. Pathogenicity – factors contributing to pathogenicity – Bacterial virulence factors, toxins and enzymes. Host parasite associations, Safety measures in Microbiology laboratory.

### Unit 7

Bacterial Genetics – chromosome, structure of DNA, RNA, Replication and extra chromosomal genetic material. Genetic variation and gene transfer in microorganisms.

### **PRACTICALS - MMB P 116 GENERAL MICROBIOLOGY**

- Staining methods.
- Culture media preparation.
- Cultivation methods.
- Isolation of bacteria
- Study of colony characters of bacteria
- Antibiotic sensitivity tests.
- Determination of MIC, MBC.
- Standardizations of disinfectants.
- Familiarisation of sterilisation methods - autoclaves, hot air oven, filters, radiation devices.

### **REFERENCES**

1. Text book of Microbiology – R.Anantha Narayanan & C.K. Jayaram Panicker.
2. Sterilization and Disinfection-G.Sykes.
3. Mackie and McCartney practical Medical Microbiology.
4. Microbiology-Daniel Lim
5. Antimicrobials in Laboratory medicine – Ashok Ratan.
6. Microbiology – Prescott.
7. Microbiology -Pelczar
8. Microbiology an introduction-Tortora

## **PART-II MMB C 114 - SYSTEMATIC BACTERIOLOGY – I**

### **THEORY**

Systematic study of bacteria and closely related microorganisms of medical importance. Classification, name, synonyms, common name, Historical considerations, Biological characters - Morphology, staining characters, motility, Growth requirements, Culture media and cultural characters.

Biochemical characters – identification tests.

Antigenic structure – Intraspecies typing methods and systems.

Role and significance in human perspective Natural habitat.

Industrial, agricultural and other significance (briefly)

Importance in medical and public health arena.

Normal occurrence, pathogenicity – pathogenesis – prophylactic and eradication methods (briefly)

Isolation and identification methods (briefly)

Antibiogram – Specific remarks if any of the following organisms

#### Unit 1

Gram positive cocci – Staphylococcus, Streptococcus, Pneumococcus.

#### Unit 2

Gram negative cocci – Neisseria, Vellieonella

#### Unit 3

Gram positive bacilli – Corynebacterium, Bacillus, Clostridium.

#### Unit 4

Mycobacteria, Nocardia, Actinomycetes

## **PRACTICALS - MMB P 117- SYSTEMATIC BACTERIOLOGY – I**

Isolation, cultivation, study of colony characters, biochemical and other identification tests. Antibiotic sensitivity tests of the organisms dealt in lecture sessions.

## **REFERENCES**

1. Text book of Microbiology – R.Anantha Narayanan, C.K.Jayaram Panicker.
2. Bailey & Scott's Diagnostic Microbiology.
3. Medical Microbiology – David Greenwood.
4. Mackie and McCartney practical Medical Microbiology.
5. Topley and Wilson's principles of Bacteriology
6. Medical Microbiology – Jawetz.
7. Manual of clinical Microbiology – Murray.
8. Medical Lab. Technology for Tropical countries – Monica Cheesebrough.

## **PART-II MMB C 115 - BIOMEDICAL INSTRUMENTATION & RESEARCH METHODOLOGY**

### **THEORY**

#### **Unit 1**

Chromatography – Principles, methods and applications of chromatography – Paper, TLC, Ion-Exchange, Affinity chromatography, Gel filtration, GLC, HPLC.

#### **Unit 2**

Electrophoresis- Principles, Procedures and application of electrophoresis. Paper, Gel, Cellulose acetate electrophoresis methods, PAGE, Immunoelectrophoresis, Isoelectric focussing.

#### **Unit 3**

Centrifugation and sedimentation – Ultra centrifugation, Density gradient centrifugation. Application – Molecular weight determination, Cell fractionation.

#### **Unit 4**

Photometry – Colorimetry – Nephelometry – principles and applications.  
Vers- Lamberd's law

#### **Unit 5**

Acids, bases, buffers, pH- methods and applications.



## Unit 6

Essential principles of Statistics and applications in Biology. Basic concepts of sampling, statistical population, random sampling, tabular and graphical presentation of data, mean, median, mode, normal distribution, probability and probability distribution, frequency distribution and frequency histograms, dispersion of data, standard deviation, coefficient of variation, mean absolute deviation, linear regression analysis, correlation coefficient, tests for distribution, scatter plots, hypothesis testing and tests of significance of parametric and non-parametric data like Wilcoxon test, Student's 't' test, 'z' test, 'F' test and chi square test, tests of confidence – confidence interval and tolerance limits, statistics in genetics. Structural organization of digital computers, Computer networking, database, image processing.

## Unit 7

Care and management of experimental animals.

## **PRACTICALS - MMB P 118- BIOMEDICAL INSTRUMENTATION & RESEARCH METHODOLOGY**

Separation of amino acids and carbohydrates by paper chromatography.

TLC of sugars and Lipids.

Column chromatographic separation of serum proteins.

Ion- exchange chromatography

Operation of HPLC and GLC

Agar, Agarose gel electrophoresis – PAGE. Electrophoresis of normal and abnormal sera – Immuno electrophoresis.

## **REFERENCES**

- 1.Harper's illustrated biochemistry- Robert.K.Murray ,Daryl K.Granner,V.W.Rodwell
- 2.Principles of biochemistry - Lehninger
- 3.Text book of Biochemistry for Medical students - D.M. Vasudevan & Sreekumari.
- 4.Text book of Medical Biochemistry - M.N. Chatterjee & Rana Shinde.
- 5.Text book of Biochemistry - G.Sathyanarayan.
- 6.Practical Clinical Biochemistry – Varley.H, Gowenlock.A.H &

Bell.M.

7.Clinical Biochemistry – Marshall

8.Essentials of Physical Chemistry – Bahl and Tuli

9.Handbook on care and management of Laboratory Animals –

U.Faw.

10. Biostatistics-A foundation for analysis in Health Sciences-John Wiley  
& Sons.

11. Keith Wilson & John Walker-Practical Biochemistry Principles and  
Techniques, Cambridge University Press

12. Boyer R.-Modern Experimental Biochemistry, Brooks Cole Thomson  
Learning

13. Wharton D.C. & Mc Carty R.E. -Experiments and Methods in Biochemistry,  
Mac Millan

14. Work T.S. & Work E.- Laboratory Techniques in Biochemistry and  
Molecular Biology

15. Cooper T.G.-The Tools of Biochemistry, Wiley

## **PART-II MMB C 120 - SYSTEMATIC BACTERIOLOGY II**

### **THEORY**

Systematic study of bacteria and closely related microorganisms of medical importance. Classification, name, synonyms, common name, Historical considerations, Biological characters - Morphology, staining characters, motility, Growth requirements, Culture media and cultural characters.

Biochemical characters – identification tests.

Antigenic structure – Intraspecies typing methods and systems.

Role and significance in human perspective Natural habitat.

Industrial, agricultural and other significance (briefly)

Importance in medical and public health arena.

Normal occurrence, pathogenecity – pathogenesis – prophylactic and eradication methods (briefly)

Isolation and identification methods (briefly)

Antibiogram – Specific remarks if any of the following organisms

### Unit 1

Gram negative bacilli–Enterobacteriaceae, Vibrios, Pseudomonas, Hemophilus, Bordetella, Brucella, Yersinia, Pasturella.

### Unit 2

Spirochaetes, Miscellaneous bacteria

### Unit 3

Non-sporing anaerobes

### Unit 4

Mycoplasma, Rickettsia and Chlamydia.

## **PRACTICALS - MMB P 123 - SYSTEMATIC BACTERIOLOGY II**

Isolation, cultivation, study of colony characters, biochemical and other identification tests. Antibiotic sensitivity tests of the organisms dealt in lecture sessions. Anaerobic culture techniques. Serotyping of bacteria.

### REFERENCES

1. Text book of Microbiology – R.Anantha Narayanan, C.K.Jayaram Panicker.
2. Bailey & Scott's Diagnostic Microbiology.
3. Medical Microbiology – David Greenwood.
4. Mackie and McCartney practical Medical Microbiology.
5. Topley and Wilson's principles of Bacteriology
6. Medical Microbiology – Jawetz.
7. Manual of clinical Microbiology – Murray.
8. Medical Lab. Technology for Tropical countries – Monica Cheesebrough.

## **PART-II MMB C 121 - VIROLOGY & MYCOLOGY**

### **THEORY**

#### **VIROLOGY**

##### Unit 1

General characters of viruses, structure, replication, cultivation, classification, Satellite virus, Laboratory diagnosis, Immunity to viral infections. Viral Vaccines and antiviral drugs.

##### Unit 2

Pox virus, Herpes virus, Adeno virus, Picorna virus.

##### Unit 3

Orthomyxo and Paramyxo viruses, Arbo and Rhabdo viruses.

##### Unit 4

Hepatitis viruses – types

##### Unit 5

Miscellaneous virus – Prions, Slow virus, Oncogenic viruses.

##### Unit 6

HIV

#### **MYCOLOGY**

##### Unit 7

Introduction, General characteristics of fungi – Classification and Taxonomy, Routine Mycological technique for the diagnosis of fungal infection.

##### Unit 8

Pathogenic fungi:

Superficial Cutaneous mycosis and etiology.

Subcutaneous mycosis – Chromomycosis, Mycetoma.

Systemic mycosis - Histoplasmosis, Blastomycosis, Coccidiomycosis and Paracoccidiomycosis

Opportunistic fungi and opportunistic fungal infections

## Unit 9

Immunology of fungal infections

## Unit 10

Mycotoxins and Mycetismus.

### **PRACTICALS - MMB P 124 - VIROLOGY & MYCOLOGY**

#### **VIROLOGY**

Handling cell cultures.

Egg inoculation technique

Viral hemagglutination

Viral immunodiagnosis – ELISA in viral infection.

Collection of specimens for fungal infection

#### **MYCOLOGY**

Preparation of media – SDA

Inoculation, incubation and identification of fungi.

KOH, LPCB mount.

Staining techniques (Differential staining techniques)

Slide culture technique.

Special test – eg: Germ tube test, Hair bait technique, Hair perforation technique

Special biochemical reactions.

Identification of common contaminant fungi

#### **REFERENCES**

1. Text book of Microbiology – Anantha Narayanan & Jayaram Panicker.
2. Medical Microbiology – Jawetz
3. Virology – Fields
4. Virology –Topley and Wilson
5. Text Book of Medical Mycology – Jagadish Chander.
6. Fundamentals in diagnostic Mycology –F.Fissure.

## **PART-II MMB C 122 - IMMUNOLOGY**

### **THEORY**

#### **Unit 1**

Basic Immunology- Basic Principles of Immunology, Types of immunity, Different types of immune responses, Components of Immune system, Haematopoiesis, Cells and organs of Immune system

#### **Unit 2**

Classification of Immunoglobulins - Their chemistry and role .- Antibody production using Animals., Monoclonal Antibody production, Theories of Antibody production, and subclasses. Isotypes, Allotypes,. Idiotypes, class switching, Abnormal Immunoglobulins

#### **Unit 3**

Antigens- definition- classification-chemistry , properties of Antigens & immunogens, haptens, partial antigens, Heterologous and homologous Antigen , super Antigen, Antigenic determinants.

#### **Unit 4**

Formation ,differentiation and maturation of B-cells, effector mechanisms and accessory cells of humoral immunity.

#### **Unit 5**

Cell mediated Immunity- T cell subtyping – based on CD's, formation, differentiation and maturation of T cells, MHC and MHC genes. Antigen processing and APC's , Lymphokines and cytokines in CMI , Effector mechanism of CMI

#### **Unit 6**

Immunoglobulin and T-cell receptor genes and their rearrangements. Genetic basis of heterogeneity, and TCR's. Antigen- Antibody Reaction Precipitation and Agglutination reactions.immunodiffusion,immunological techniques- ELISA,

RIA, Immuno blotting techniques, Neutralizations test, Coomb's test, Immunofluorescence, immunocytochemical/histochemical techniques

#### Unit 7

Complement system, its components, and pathways. Regulation, consequence of complement activation.

#### Unit 8

Principles of Immunization Molecular basis & Immunological memory. Different types of vaccines and vaccination schedules.

Immunity to infections by viruses, bacteria, fungi, protozoal and other parasites.

Mechanism of - Antibody Mediated inactivation.-Direct and indirect

#### Unit 9

Definitions, types of hypersensitivity -Allergy, drug allergy: Atopy, Auto immunity, Immune deficiency disorders, Connective tissue diseases, Tumor immunology, Immunology of AIDS

#### Unit 10

Immunohematology and transfusion immunology, Transplantation immunology, GVHR, Granulomatous reaction, HLA typing.

### **PRACTICALS - MMB P 125 - IMMUNOLOGY**

Antigen – Antibody Reaction-Agglutination, Coagulation and Precipitation Reactions WIDAL and VDRL tests, Immunodiffusion, Immunoelectrophoresis of plasma Immunoglobulin, Demonstration of RIA, Western Blott, Hemagglutination test – Blood grouping, Hemagglutination inhibition test. Coomb's test – ICT, DCT, Complement fixation test.

Lymphocyte culture, Delayed type hypersensitivity testing, Detection of Tumor markers, Histocompatibility testing, Detection of Immuno complex, FITC Conjugation of Antibody, Isolation of lymphoid organs of mice, Neutrophil function test

## REFERENCES

1. Goldsby R.A. Kindt T.J. Osborne B.S. and Kuby. J- Immunology-W.H. Freeman and Co.
2. Roitt I and Delves P.J. - Essential Immunology, Blackwell Science
3. Roitt I, Brostoff J, Male. D-Immunology, Mosby
4. Weir D.M. and Stewart J- Immunology, Churchill Livingstone
5. Stites D.P, Terr A.I. and Parslow T.G- Basic and Clinical Immunology Prentice Hall International Inc.

## **PART-II MMB C 127 - PARASITOLOGY & ENTOMOLOGY**

### **THEORY**

#### Unit 1

Introduction, Laboratory diagnosis of parasitic infection.

#### Unit 2

Protozoal infection –Entamoeba, freeliving amoebiasis,Intestinal,Oral and Genital Flagellates, Blood and Tissue Flagellates, Malaria parasites, Coccidia,Ciliates, Pneumocystis, Microsporidium, Cryptosporidium, Babesia.

#### Unit 3

Helminthology – Cestodes, Trematodes, Nematodes

#### Unit 4

Larval infection

#### Unit 5

Entomology pertaining to transmission of parasitic and other microbial infections. (Ticks, Mosquitoes, Bed bug, Cyclops, House fly, Sand fly, Tse- tse fly, Rat flea, mites and lice).

## **PRACTICALS - MMB P 129 - PARASITOLOGY & ENTOMOLOGY**

Examination of stool for parasites

Concentration technique.



Examination of blood for malarial parasites, Microfilaria & hemoflagellates.

Examination of sputum for parasites, larva etc.

Cultivation of amoeba.

Examination of bone marrow for L.D. bodies.

Serology for Toxoplasmosis.

Iron-hematoxylin staining

### **REFERENCES**

1. Parasitology – K.D.Chatterjee.
2. Text book of Parasitology – C.K.Jayaram Panicker.
3. Text book of Medical Parasitology-Subhash Chandra Parija
4. Human Parasitology-Chang
5. Diagnostic Parasitology-Garscia

## **PART-II MMB C 128 MOLECULAR BIOLOGY AND MEDICAL GENETICS**

### **THEORY**

#### **Unit I**

Microbial genetics-structure recombination and variations in bacterial and viral genome, mutations, recombinations and transposable elements.

#### **Unit II**

DNA replication in prokaryotes and eukaryotes, DNA damage, repair mechanisms and human diseases, telomeres, telomerase and end replication, inhibitors of replication.

Transcription in prokaryotes and eukaryotes, post transcriptional processing of mRNA-snRNA, hnRNA and small nuclear ribonucleo proteins, rRNA processing- self splicing RNA's and ribozyme, processing of tRNA, DNA- protein interactions and DNA binding motifs.

#### **Unit 3**

Genetic code, ribosomes and translation, post-translational modifications, protein folding and chaperonins, prions, prion diseases, Alzheimer's disease and other tauopathies, protein targeting, protein sorting, transport, secretion and trafficking of proteins, compartment disorders, inhibitors of protein synthesis and related disorders, regulation of gene expression in prokaryotes and eukaryotes, molecular bases of morphogenesis and ageing, theories of ageing.

Mitochondrial genome, expression of mitochondrial DNA, mt.DNA mutations, deletions and human diseases, tRNA mutations.

#### **Unit 4**

Molecular Oncology:- Molecular events in cell cycle-cyclins, CDK's, growth factors and transcription factors in the regulation of cell cycle and their role in apoptosis and cancer, nomenclature of tumors, alterations in morphology, ultrastructure and metabolism of cancer cells, metastasis, molecular basis of cancer - procarcinogens and their activation, oncogenes, protooncogenes, pseudogenes and tumour suppressor genes, role of growth factors in malignant transformation, role of proteinases and proteinase inhibitors in metastasis and anticancer therapy, anticancer therapeutic agents and their mechanism of action.

## Unit 5

DNA Technologies and Genetic Engineering :- Restriction endonucleases and their nomenclature, DNA sequencing techniques - chemical, enzymatic and automated sequencing methods, restriction mapping, recombinant DNA technology - cloning techniques, cloning vectors, ligation of foreign DNA, methods of gene transfer, cDNA and genomic library, screening for recombinants, blotting techniques - Western, Southern, and Northern blotting, PCR and LCR and their applications, RFLP's and DNA finger printing, RNA finger printing, applications of recombinant DNA technology in bio-medical sciences, transgenes, transgenic animals and their uses.

## Unit 6

Medical Genetics:- Organization of the human genome, gene and chromosome structure, function and inheritance, repetitive DNA in human genome, functional organization of telomeres and centromeres, methods for human genetic study-pedigree analysis, chromosomal analysis, biochemical analysis, somatic cell and molecular genetic analysis, human genome mapping – genetic mapping, physical mapping, RFLP's, pulse field gel electrophoresis, yeast artificial chromosomes, bacterial artificial chromosomes, P1 derived artificial chromosomes, expressed sequence tags, sequence tagged sites, microsatellite and single nucleotide polymorphisms, human genome project, identification and isolation of disease genes, karyo-typing, preimplantation, prenatal, perinatal and neonatal screening for inherited disorders using gene cloning, RFLP's, PCR, mini-satellites and micro satellites, socio-ethical and medico-legal considerations of human genetics and genetic counseling, gene therapy.

## Unit 7

Genomics-data bases in gene and genome analysis, data mining, inventories and sequence homology search, introduction to pharmacogenetics and toxicogenetics, elements of nano technology.

Proteomics- 2-D analysis of cell proteins, analysis and sequencing of individuals spots by Mass spectrometry (Malditoff) and protein microarrays.

## Unit 8

Cell culture – Basic principles of animal and human cell and tissue culture, culture media, culture equipments, decontamination etc., long term and short term cultures, lymphoblastoid cell lines and stem cell biology, applications of cell and tissue cultures in biomedical sciences.

## **PRACTICALS – MMB P 130- MOLECULAR BIOLOGY AND MEDICAL GENETICS**

Study of mitotic and meiotic stages, Isolation of nucleic acids from prokaryotes and eukaryotes, determination of rat spleen DNA content by diphenylamine method, Electrophoretic separation of nucleic acids, PAGE isolation of rat spleen DNA, isolation of plasmids, isolation of mutants, Ames test, Karyotype preparation, PCR.

Visit to molecular biology lab of reputed institutions for acquainting with DNA manipulations and molecular diagnostic techniques. Recommended institutions – institutions with the facilities of PCR and other DNA manipulation techniques.

### **REFERENCES**

1. Lewin B- Genes VII, Oxford University Press
2. Freidfelder, D- Molecular Biology, Oxford Immunity Press
3. Elliot W.H. and Elliot D.C-Biochemistry and Molecular Biology, Oxford University Press
4. Sheeler P. and Bianchi D.E-Cell and Molecular Biology, John Wiley and Sons
5. Tamarin R.H.-Principles of Genetics, Tata Mc Graw Hill
6. Gardener, Simmons and Snustad-Principles of Genetics
7. Gelehrter -Principles of Medical Genetics, J.B. Lippincott
8. Mueller R. and Young L-Emery's Elements of Medical Genetics, Churchill Livingstone
9. Primrose S.B.-Principles of Gene Manipulation, Blackwell Science
10. Ruddon R.W(ed) -Cancer Biology, Oxford University Press
11. Tannock I. F. and Hill R.P- The Basic Science of Oncology, Pergamon Press
12. Franks L.M. and Teich N.M. -Introduction to Cellular and Molecular Biology of Cancer, Oxford University Press
13. Kumar A and Srivastava A.K-Advanced Topics in Molecular Biology, Horizon Scientific Press

## PART-II MMB C 134 - CLINICAL MICROBIOLOGY

### **THEORY**

#### Unit 1

Normal flora of human body.

Epidemiology, Aetiology, Pathogenicity, Pathogenesis, diseases, Laboratory diagnostic procedures and prophylactic measures of the following

#### Unit 2

Respiratory tract infections: Upper respiratory tract-aetiology, transmission, pathogenesis, epidemiology and clinical features of the following

Common cold, pharyngitis and tonsillitis, otitis and sinusitis, acute epiglottitis, oral cavity infections, laryngitis and tracheitis, diphtheria

Lower respiratory tract- whooping cough, bronchitis, RSV infections, bacterial pneumonia, viral pneumonia, tuberculosis, cystic fibrosis, lung abscesses

Diagnosis of respiratory tract infections.

#### Unit 3

Urinary tract infections and sexually transmitted diseases

Bacterial, viral and fungal infections of urinary tract-aetiology, pathogenesis, transmission, clinical features, complications and diagnosis.

Aetiology, transmission, clinical features, and diagnosis of syphilis, gonorrhoea, chlamydial infections, HIV, bacterial vaginosis, genital herpes, papilloma virus infections, opportunistic STDs.

#### Unit 4

Gastrointestinal tract infections : Aetiology, pathogenesis, clinical features and diagnosis of diarrheal diseases (bacterial and viral), *Helicobacter pylori*, food poisoning, parasites in the GI tract, systemic infections from GI tract.

#### Unit 5

Central nervous system infections : meningitis caused by bacteria, virus, fungi and protozoa, viral encephalitis, brain abscesses, tetanus, botulism.

#### Unit 6

Infections of the skin, ear and eye : Aetiology, transmission, diagnosis and prevention.

#### Unit 7

Pyrexia of unknown origin, Blood Infections: Aetiology, transmission, diagnosis and prevention, Endocarditis.

#### Unit 8

Zoonotic infection, Food, water and air borne infections.

### **PRACTICALS - MMB P 136 CLINICAL MICROBIOLOGY**

Study of normal flora of human body

Isolation, characterization and identification of pathogens from various clinical specimens

Study of antibiotic sensitivity of common pathogens

Assay of antimicrobial agents in body fluids

Investigations on Hospital infection samples

### **REFERENCES**

1. Medical Lab manual – Monica.
2. Text book of Microbiology - Anantha Narayan & Jayaram Panicker
3. Clinical and Pathogenic Microbiology – Barbara.
4. Bailey & Scott's Diagnostic Microbiology.

### **PART-II MMB C 135 - DIAGNOSTIC MICROBIOLOGY**

#### **THEORY**

##### Unit 1.

Organisation, design and structure of a diagnostic Microbiology Laboratory, Biological safety measures, specimen collection, storage, transportation.. Quality control, Modern techniques employed in Clinical Microbiology laboratory , Automation.

##### Unit 2.

Collection, transport, processing and storage of the following specimens :-

Blood, Urine, Pus, Sputum, Swabs, Stool, Body fluids, Vomits, CSF, Biopsy specimens, Scrapings (Skin, Eye, Hair, Nail)

### Unit 3

Nosocomial infections : epidemiology, bacterial and viral infections, infections in paediatric patients, surveillance and control programmes, organizations and associations involved, role of microbiology lab in prevention and control, device-associated intravascular infections and its control, sterilisation, disinfection and antiseptics in hospitals

### Unit 4

Microbiology of air, water and milk: common pathogens encountered, methods for microbial analysis, methods for purification, Sterility testing.

### Unit 5

Serodiagnosis/serological and immunological tests  
agglutination test-Direct and Indirect  
precipitation test  
Neutralisation test  
Complement fixation test  
Tracer Techniques-ELISA, RIA, IMMUNOFLOUORESCENCE,  
Delayed type hypersensitivity test (skin tests)

## **PRACTICALS - MMB P 137 DIAGNOSTIC MICROBIOLOGY**

Microbiological investigations on specimens like

- Urine, feces, purulent material, CSF, blood, Sputum and Body fluids.
- Blood smear for parasites.
- Feces examination for parasites.
- Microbiological examination of specimens for fungal elements.
- Cultivation and identification of fungi.
- Study of microbial flora of air in various localities
- Microbial analysis of water
- Microbial analysis of milk
- Sterility testing.

## REFERENCES

1. Microbiology in clinical Practice – Shanson.
2. Bailey & Scotts Diagnostic Microbiology
3. Medical Lab manual – Monica.
4. Koneman's colour atlas and text book of diagnostic microbiology-Winn Washington .C
5. Diagnostic Microbiology- Mahron C.R; George Munuselis
6. Essentials Of Diagnostic Microbiology- Shimeld Lish Ann

## **PART-II MMB C 138 RESEARCH PROJECT**

Students in the Sixth Semester after completion of their Practical/ Clinical Training will progress to the curricular Research Project. Each student is required to undertake and carry out a brief research work on a topic in Bio-Medical Sciences of current importance. After completion of the research project in the stipulated time, each student has to submit 3 hard copies and 2 soft copies of the dissertation report of the work before registering for the final Semester Examinations.



## **MSc. MEDICAL MICROBIOLOGY – ELECTIVES**

### **1. FOOD & DAIRY MICROBIOLOGY**

#### **FOOD MICROBIOLOGY**

##### **UNIT -I**

Food spoilage - Chemical and physical properties of food affecting ,microbial growth (intrinsic and extrinsic factors), Sources of spoilage causing micro-organisms , Spoilage of - Meat and Poultry products, Bread, Fruits and Vegetables, Eggs, Canned fruits .

##### **UNIT II**

Food preservation - Principles of food preservation, Use of chemicals and antibiotics in food preservation, Canning ,Dehydration ,Thermal destruction of bacteria - Use of low temperature and high temperature, Determination of TDP, TDT, D, F, and Z values,Use of radiations.

##### **UNIT III-**

Microbial food poisoning and food infection. Food poisoning with reference to sources and prevention of the following: Staphylococcus aureus ,Campylobacter Clostridium botulinum Aspergillus flavus.

##### **UNIT IV-**

Organisms causing food infection with reference to their sources and prevention of the following: Salmonella , Vibrio parahemolyticus .

##### **UNIT -V**

Fermented foods -Significance of fermented foods (increase in shelf life and probiotic) , Starter cultures for curd preparation and fermentation of idli batter.

#### **DAIRY MICROBIOLOGY**

##### **UNIT I**

Milk: Definition, Composition and Types of Milk (skimmed, toned and homogenized. Concept of clean milk (as per National Dairy development Board (NDDB) norms.

##### **UNIT II**

Microbial analysis of milk, Microflora of raw milk,Dye reduction test (using methylene blue and resazurin) ,Total bacterial count,Brucella ring test and tests for mastitis, Somatic cell count .

### UNIT III

Spoilage of milk , Succession of microorganisms in milk, leading to spoilage, Color and flavor defects , Sweet curdling, Stormy fermentation , Ropiness.

### UNIT IV

Pasteurization of milk, Methods of Pasteurization –LTH, HTST, UHT, Phosphatase test for determination of efficiency of Pasteurization.

### REFERENCES:

Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.

Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.

Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw Hill Publishing Company Ltd, New Delhi, India.

Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.

Ecles, C.H & Macy , combes, 1973, Milk and milk products, 4th Edn, TMH.

## **2. HAEMATOLOGY AND CLINICAL TECHNIQUES**

### UNIT- I

Blood: Definition, Characters, Composition.

Collection of Blood. Capillary Blood: From Adults/Infants, Examinations Employed.

Advantages/Disadvantages

Venous Blood: From Adults/Infants, Examinations Employed.

Anticoagulants: Definition Type: Double Oxalate/EDTA /Heparin /Citrate, Concentration Examinations done.

### UNIT- II

Counting of Blood Cells: Neubauer counting chamber, Total RBC count and WBC count: diluting Fluids, Macro Dilution/Micro Dilution Technique, Normal values, correction for TWBC ,Absolute Eosinophil count ,Differential Leucocyte count:Granulocyte/Agranulocytes:

Morphology/Function, Staining Technique .Platelet Count: Morphological Characters/Functions, Direct/Indirect method Reticulocyte count Dry/Wet Smear Technique.  
Haemoglobin: Composition/Normal Values: Determinations: Tallqvist/Acid Haematin/Alkaline Haematin, Haldane's Carboxy/Drabkins/Dare, Spencers/Specific Gravity, Chemical.

### UNIT- III

Coagulation Mechanism: Factors: Bleeding Time Clotting Time,Packed Cell Volume: Wintrobes/Micro HCT method  
Mean corpuscular Volume ,Mean Corpuscular haemoglobin  
Mean Corpuscular haemoglobin concentration, Volume index  
volume thickness index ,Mean corpuscular diameter  
saturation index, Erythrocyte Sedimentation Rate -Principle  
Determination: Wintrobes/Westegren.

### UNIT – IV

Preparations of stains and staining techniques: -Wright stain, Leishmans stain, Giemsa's stain, Jaswanth singh and Bhattacharji stain, Fields stain ,Peroxidase stain:  
Examination of Blood smear- Peripheral smear report: Size/colour/shapes/inclusions. Blood parasites: Malarial parasite/Microfilaria.

### UNIT -V

ABO Grouping: History/Discovery ,slide / Tube Technique, Rh. Typing: Slide/Tube Technique, Bovine Replacement Technique ,Coombs Test: Direct/Indirect Donor screening, Cross Matching: Major/Minor Collection of blood/preservation /storage.

### References

- 1.Dacie & Lewes Practical hematology, International edition- 11<sup>th</sup> Edition
- 2.Wintrob's Clinical Hematology- 13<sup>th</sup> edition
- 3.Textbook Of Medical Laboratory Technology- Ramnik Sood
- 4.Textbook Of Medical Laboratory Technology- 2<sup>nd</sup> Edition- Godker
- 5.Medical Laboratory Technology, Vol I,II & III- 2<sup>nd</sup> editon- Kanai.L.Mukherjee
- 6.Clinical Hematology and Fundamentals of Hemostasis- 5<sup>th</sup> edition- Denise. M. Harmening

### **3.BASIC NUTRITION**

#### UNIT-I

Introduction to nutrition - Food as source of nutrients, functions of food, definition of nutrition, nutrients & energy, adequate, optimum & good nutrition, malnutrition.

#### UNIT-II

Nutrition - Fitness, Athletics & Sports, Food guide - Basic five food groups  
How to use food guide (according to R.D.A.) Interrelationship between nutrition & health : -  
Visible symptoms of good health, Use of food in body - Digestion, Absorption, transport & utilization. Role of fibres in human nutrition.

#### UNIT -III

Carbohydrates : Functions, classification, food sources, storage in body.  
Fats & oils : composition, saturated and unsaturated fatty acids, classification, food sources, function of fats.  
Proteins - composition, sources, essential & non-essential amino acids, functions,  
Protein deficiency. Water - as a nutrient, function, sources, requirement, water balance & effect of deficiency.

#### UNIT – IV

Minerals - macro & micronutrients. - functions, sources. Bioavailability and deficiency of Calcium, Iron, Iodine, Sodium & Potassium (in very brief)  
Vitamins (water & fat soluble) - definition, classification & functions.

#### UNIT – V

Effect of cooking & heat processing on the nutritive value of foods.  
Processed supplementary foods, Food sanitation in hygiene.

#### References

1. Krause's Food & the Nutrition Care Process, 13th Edition, 2012.
2. Modern Nutrition in Health and Disease (Modern Nutrition in Health & Disease (Shils)) Eleventh Edition, 2014.
3. Advanced Nutrition and human metabolism by James L. Groff & Sareen Gropper, 6th edition, 2013.
4. Text book of Biochemistry and Human Biology, Talwar G.P., Srivatsava LN. and Mondgil K.D., New Delhi, Prentice Hall., 3rd edition, 2003.
5. Text book of Biochemistry with Clinical Correlations, Devlin D.T, New York, John Wiley and Sons., 7th edition, 2010.

## 4. NON-COMMUNICABLE DISEASES

### UNIT I

To give an understanding of the pathophysiology of some common NCDs.  
Classification, biochemistry, clinical manifestations, diagnosis and, treatment.

### UNIT -II

To understand the risk factors for common NCDs, and methods of disease control and health promotion.

### UNIT-III

Overview and introduction to NCDs, Pathophysiology (including biochemical and genetic parameters), cardinal signs, clinical and diagnostic features (with special emphasis on biochemical parameters), treatment (please emphasize pharmacological component) prevention and control.

### UNIT -IV

Asthma, Cancer, Cardiovascular diseases, Chronic rheumatic diseases, Diabetes, Tobacco/alcohol/substance, abuse related illnesses and their control, Tobacco use, Tobacco related illnesses and tobacco control, Obesity.

### UNIT – V

Epidemiology of NCDs, risk factors, global profile and predictions prevention and control of NCDs

#### References

1. Robbins & Cotran Pathologic Basis of Disease- 9<sup>th</sup> edition- Vinay Kumar, Abdul K. Abbas & Jon. C. Aster.
2. Anderson's Pathology- 10<sup>th</sup> edition - Ivan Damjanov, James Linder.
3. Harrison's Principles of Internal Medicine, Volume 1 & 2, 19<sup>th</sup> edition.
4. Oxford Textbook of Medicine Fifth Edition David A. Warrell, Timothy M. Cox, and John D. Firth 2010 .
5. Textbook Of Medicine P.C. Das 2002
6. Textbook of Forensic Medicine and Toxicology : Nagesh Kumar G Rao, 1<sup>st</sup> edition, 2003.
7. Mahajan & Gupta Textbook of Preventive and Social Medicine, 4<sup>th</sup> edition, 2013.

## 5.EPIDEMIOLOGY AND CONTROL OF INFECTIOUS DISEASES

### UNIT- I

General overview of infectious diseases and their impact in developing countries.  
Pathogenesis and clinical presentation of common infections.

### UNIT- II

Vaccine preventable diseases: TB, polio, diphtheria, tetanus, and measles.

### UNIT- III

Respiratory: Tuberculosis, leprosy, ARI's  
Intestinal: Diarrhoea, typhoid, and worm infestations  
Contact: STDs and AIDS  
Vector borne: Plague, rabies, malaria and filaria, JE, dengue, leptospirosis.

### UNIT -IV

National disease control programmes for :-

Vector Control  
Tuberculosis  
AIDS  
Diarrheal disease  
Leprosy.

### References

1. Disease control priorities in developing countries: Dean T Jamison (2006), 2<sup>nd</sup> edition.
2. Nelson K E : Infectious disease epidemiology : theory and practice,3rd edition.
3. Epidemiologic methods for study of infectious diseases Ed J C Thomas, D J Weber,2001.
4. Griesecke J: Modern infectious disease epidemiology.2nd edition,2001.
5. Infectious Diseases of human : Dynamics &Control.R.M Anderson, R.M May 1991.

## **6.GENERAL PATHOLOGY**

### **UNIT I**

Definitions and causes of diseases:- definitions in Pathology and causes of cell injury. Modes of cell injury:- mechanisms of cell injury & the morphological changes. Necrosis & gangrene:- types of necrosis and gangrene at gross and microscopic levels Apoptosis and its relevance.

### **UNIT II**

Acute inflammation:-Chemical mediators of Inflammation:- Definition, Classification, description of each type, role of acute chronic inflammation. Chronic inflammation (including granulomatous):- aetiology, patterns and systemic effects of granulomas. Regeneration and repair (general):-regeneration and repair

### **UNIT III**

Oedema:-Define oedema, classify and describe pathogenesis & correlate morphology with clinical significance with emphasis on transudate and exudate. Shock:-Define, classify and understand pathogenesis, recognize the of mediators and stages of shock. Thrombosis:- etio-pathogenesis, fate. Embolism and Infarction:- types of embolism and infarction, recognize morphological changes and correlate clinical significance. Hyperaemia and Haemorrhage:- Definitions, morphology of acute and chronic congestions, clinical significance of haemorrhage. Disturbances of pigment metabolism:-State the type of pigment disturbances and describe the changes associated with common disturbances like lipofuscin, melanin, Hemosiderin and Bilirubin.

### **UNIT IV**

Hypersensitivity reactions:-Classification, Hypersensitivity reactions-Differentiation.

AIDS:-Understand the natural history of the disease and recommend relevant investigations in the management.

### **REFERENCE:**

1. Robbins & Cotran Pathologic Basis of Disease- 9<sup>th</sup> edition- Vinay Kumar, Abdul K. Abbas & Jon. C. Aster
2. Boyd's Textbook of Pathology- Vol I: General pathology- J.R. Bhardwaj, Prabal Deb-10<sup>th</sup> Edition
3. Walter & Israel General Pathology- 7<sup>th</sup> edition- J.B Walter, I.C Talbot
4. Anderson's Pathology- 10<sup>th</sup> editon -Ivan Damjanov, James Linder
5. Text book of Pathology- Harsh Mohan- 7<sup>th</sup> edition
6. Cells, tissues, and disease-Principle of General Pathology- 2<sup>nd</sup> edition-Guido Majno, Isabelle Joris

## **7. PHARMACEUTICAL MICROBIOLOGY**

### **UNIT I**

Antibiotics and synthetic antimicrobial agents(Aminoglycosides,  $\beta$  lactams, tetracyclines, ansamycins, macrolid antibiotics)Antifungal antibiotics, antitumor substances.Peptide antibiotics, Chloramphenicol, Sulphonamides and Quinolinone antimicrobial agents.Chemical disinfectants, antiseptics and preservatives.

### **UNIT II**

Mechanism of action of antibiotics (inhibitors of cell wall synthesis, nucleic acid and protein synthesis).Molecular principles of drug targeting.Drug delivery system in gene therapyBacterial resistance to antibiotics.Mode of action of bacterial killing by quinolinones.Bacterial resistance to quionolinones.Mode of action of non – antibiotic antimicrobial agents.Penetrating defenses – How the antimicrobial agents reach the targets (cellular permeability barrier, cellular transport system and drug diffusion).

### **UNIT III**

Microbial production and Spoilage of pharmaceutical Products.Microbial contamination and spoilage of pharmaceutical products (sterile injectibles,non injectibles, ophthalmic preparations and implants) and their sterilization.Manufacturing procedures and in process control of pharmaceuticals.Other pharmaceuticals produced by microbial fermentations (streptokinase,streptodornase).

### **UNIT IV**

New vaccine technology, DNA vaccines, synthetic peptide vaccines, multivalent subunit vaccines. Vaccine clinical trials.Application of microbial enzymes in pharmaceuticals.

### **References**

- 1 . Pharmaceutical Microbiology – Edt. by W.B.Hugo & A.D.Russell Sixth edition. Blackwell scientific Publications.
2. Analytical Microbiology –Edt by Frederick Kavanagh Volume I & II. Academic Press New York.
3. Quinolinone antimicrobial agents – Edt. by David C. Hooper, John S.Wolfson .ASM Washington DC.
4. Quality control in the Pharmaceutical Industry - Edt. by Murray S.Cooper Vol.2. Academic Press New York.,1973.