

Faculty of Medicine



JSS Academy of Higher Education & Research

Deemed to be University)

Re-Accredited "A+" Grade by NAAC

Sri Shivarathreeswara Nagara, Mysuru - 570 015, Karnataka

Regulation & Syllabus

M.Sc. MEDICAL MICROBIOLOGY
2020

MSc

Regulations & Syllabus

M.Sc. IN MEDICAL MICROBIOLOGY

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Postgraduate MSc in Medical Sciences

Programmes Offered

1. MSc Medical Anatomy
2. MSc Medical Physiology
3. MSc Medical Biochemistry
4. MSc Medical Pharmacology
5. MSc Medical Microbiology

Goals

The Goals of Postgraduate MSc in Medical Sciences is to produce

1. Competent medical and biomedical teachers with a sound knowledge in basic sciences.
2. Personnel with translational research knowledge
3. Skilled laboratory experts
4. Industry technical experts
5. Competent individuals with emotional intelligence

General Objectives

At the end of the postgraduate training in the discipline concerned the student should be able to:

1. Develop skills in using educational methods and techniques as applicable to the teaching of medical/biomedical/allied health workers.
2. Demonstrate competence in developing diagnostic and analytical tools
3. Demonstrate competence in basic concepts of research methodology and be able to critically analyse relevant published research literature

Components of the course curriculum:

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical skills
- Diagnostic and analytical skills
- Project skills.
- Attitudes including communication skills.
- Training in research methodology.

Self- learning mode- Seminars, assignments, group discussions, journal club presentations, Problem solving exercises.

Regulations

1. Branch of the study

Post graduate degree Programme

2. Courses offered in M.Sc Medical Sciences:

- a. MSc in Anatomy
- b. MSc in Physiology
- c. MSc in Biochemistry
- d. MSc in Pharmacology
- e. MSc in Microbiology

3. Eligibility for Admission

A candidate seeking admission to MSc medical science course must have passed BSc with at least one subject of biological Sciences or BAMS or MBBS or BHMS or BPT or BPharm or any other Science/ professional graduates from a recognized University

4. Duration of the course

The duration of the course shall be a period of 3 years (6 semesters)

5. Medium of instructions

The medium of instruction and examination shall be in English

6. Method of Training

Training includes involvement in theory classes, practical skills, laboratory and experimental work, research studies, Self- learning mode - Seminars, assignments, group discussions, journal club presentations.

7. Attendance

Candidates should have attended at least 80% of the total number of classes conducted in each semester, from the date of commencement of the term to the last working day, as notified by the JSSAHER, in each of the subjects prescribed for that semester, separately in theory and practical, to be eligible to appear for the examinations.

8. Monitoring Progress of Studies:

A) Formative Assessment

Formative assessment will be done continually to assess medical knowledge, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

Two Internal Assessment tests will be conducted for both theory and practical in each semester covering all domains of learning and feedback

will be provided for improvement of the student. Average of two internal assessments in theory and practical's separately will be considered for final internal assessment marks. A candidate should get minimum 50% IA marks separately in theory and practical to be eligible for final JSSAHER examinations.

The candidates who have failed in final examination shall be given an internal assessment improvement test and the best marks shall be submitted to JSSAHER when called for.

B) Summative Assessment

The end semester examination for core papers both for theory and practical will be conducted by JSS AHER. For allied papers, general electives and discipline specific electives examination will be conducted by respective colleges

C) Project Work

During study every candidate must perform a project on the selected topic under the guidance and supervision of a recognised postgraduate teacher. The project should be aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search, review of literature, getting acquainted with recent advances, designing a research study, collection of data, critical analysis, and comparison of results and drawing conclusions.

The suggested time schedule for project work is:

- Identification and selection of topic for project in third semester.
- Preparation of synopsis and submission of the synopsis for ethical clearance in third semester as per the dates notified by the ethical committee. Such synopsis will be reviewed, and the project topic will be registered by the JSS Academy of Higher Education and Research. No change in the project topic or guide shall be made without prior approval of the JSSAHER.
- Project work should start from third semester onwards.

Submission of Project Report

Four copies of the project report shall be submitted to the controller of examination of the JSSAHER two months before sixth semester examination or as per the dates notified by the JSSAHER.

The Project should be written under the following headings

- i. Introduction
- ii. Aims and objectives of study
- iii. Review of Literature
- iv. Material and Methods
- v. Results
- vi. Discussion

- vii. Conclusion
- viii. Summary
- ix. References
- x. Tables
- xi. Annexure

The project shall be valued by examiners appointed by the JSS Academy of Higher Education and Research. Approval of project work is an essential precondition for a candidate to appear for the final examination.

A co-guide may be included provided the work requires substantial contribution from a sister department or from another medical institution recognized for teaching/training by JSS Academy of Higher Education and Research.

Project Evaluation: Every semester student shall present the progress of the project and monitored by the respective guide. Project work shall be presented during sixth semester examinations and carries 100 marks.

D) Maintenance of Logbook and Practical record

A diary showing each day's work must be maintained by the candidate, which shall be scrutinized by the Head of the department every month. A list of the seminars and journal reviews that have been attended and presented by the student has to be maintained which should be scrutinized by the Head of the Department.

Practical record must be maintained by every candidate and duly scrutinized and certified by the head of the department and to be submitted to the external examiner during the final examination.

E) Seminars, Journal clubs and Teaching:

Students are expected to actively participate in the departmental seminars and journal clubs. A record should be maintained for each student with the list of seminars and paper presented in journal club by each student.

Post graduate students should participate in undergraduate teaching, in theory, practical and tutorials.

9. Course of study

First and Second semester subjects are common to all medical MSc programmes. Students can choose one among the general electives and discipline specific electives mentioned in the respective semesters.

Course of study: Subjects and hours of teaching for theory, practical and clinical training

First Semester

Theory		Hrs	Credits
Core 1	Anatomy I: General anatomy, general histology, general embryology and thorax	40	4
Core 2	Physiology I	40	4
Core 3	General biochemistry	40	4
Practicals			
Module1	Anatomy I: General anatomy, general histology, general embryology and thorax	30	1
Module2	Physiology I	30	1
Module3	Basic biochemistry experiments Part I	30	1
Non- Core Subjects			
General Electives	Yoga/Music	30	2
Total		250	17

Second semester

Theory		Hrs	Credits
Core 4	Anatomy II: Abdomen, Pelvis, Head & Neck and Systemic histology	40	4
Core 5	Physiology II	40	4
Core 6	Energy metabolism and metabolism of biomolecules	40	4
Practicals			
Module1	Anatomy II: Abdomen, Pelvis, Head & Neck and Systemic histology	30	1
Module2	Physiology II	30	1
Module3	Basic Biochemistry Experiments: Part -II	30	1
Non-Core			
General Electives	Humanities/ Health economics	30	2
Total		250	17

MSc Medical Microbiology

Third semester

Theory		Hrs	Credits
Core M1	General Microbiology	40	4
Core M2	Immunology	40	4
Core M3	Clinical Laboratory postings	40	4
Practicals			
Module M1	Serological techniques, Media preparation	30	1
Module M2	Culture techniques, Staining	30	1
Non-Core			
Allied 1	Research Methodology & Bioethics	30	2
Gene Electives	Soft skills / Teaching & Learning methodology	30	2
Total		240	18

Fourth semester

Theory		Hrs	Credits
Core M4	Bacteriology	40	4
Core M5	Bacteriology & Parasitology	40	4
Core M6	Clinical Laboratory postings	40	4
Practicals			
Module M3	Pure culture processing, Mixed culture processing, Serological tests for infectious disease	30	1
Module M4	Stool examination, Stool concentration techniques & Modified ZN staining, Peripheral smear examination for hemoparasites and antigen detection for malarial parasites, Requirements for stool examination and reagents preparation.	30	1
Non-Core			
Allied 2	Biostatistics	30	2
DSE	Immunofluorescence/Environmental surveillance	30	2
Total		240	18

Fifth semester

Theory		Hrs	Credits
Core M7	Virology	40	4
Core M8	Mycology	40	4
Core M9	Clinical Laboratory postings	40	4
Practicals			
Module5	Serological techniques in Virology – ICT, Viral serology - CLIA, ELISA.	30	1
Module6	Fungal stain preparation, Fungal media preparation and QC, Identification of Fungi-yeasts, mould, Slide culture techniques	30	1
Non - Core			
Skill enhancement	Internship training	-	14
DSE	Laboratory accreditation / Molecular techniques	30	2
Total		240	30

Sixth Semester

Project work	credits 20
Value added programme: Workshops on career-life balance, CV-writing, and interviewing	credits 10
Total	credits 30

10. Conduct of Examination

The end semester examination for core papers will be held at the end of each semester for both Theory and Practical separately, conducted by JSS AHER. Examinations for non- core subjects will be conducted by respective Colleges. Division of marks for non - core paper will vary according to the subjects.

Theory Examination: – 3 hours paper, 100 marks for each core paper.

Pattern of theory question paper

Theory			
Type of Questions	Number of Questions	Marks for each question	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short Answer	10	3	30
Total Marks			100

Examination Pattern:

First Semester- JSSAHER Examination				
Theory Examination				
Category	subjects	IA	Final Exam	Total
Core 1	Anatomy I: General anatomy, general histology, general embryology and thorax	100	100	200
Core 2	Physiology I	100	100	200
Core 3	General biochemistry	100	100	200
Practicals				
Module1	Anatomy I: General anatomy, general histology, general embryology and thorax	100	100	200
Module2	Physiology I	100	100	200
Module3	General biochemistry	100	100	200
Non -Core subjects				
		Theory	Practical	Total
Gen Electives	Yoga/Music	25	25	50

Second Semester- JSSAHER Examination				
Theory Examination				
Category	subjects	IA	Final Exam	Total
Core 4	Anatomy II: Abdomen, Pelvis, Head Neck and Systemic histology &	100	100	200
Core 5	Physiology II	100	100	200
Core 6	Energy metabolism and metabolism of biomolecules	100	100	200
Practicals				
Module1	Anatomy II: Abdomen, Pelvis, Head Neck and Systemic histology &	100	100	200
Module2	Physiology II	100	100	200
Module3	Basic Biochemistry Experiments: Part -II	100	100	200

Non - Core subjects				
		Theory	Practical	Total
Gen Electives	Humanities/ Health economics	50	--	50

MSc Medical Microbiology

Third Semester- JSSAHER Examination				
Theory Examination				
Category	Subjects	IA	Final Exam	Total
Core M1	General Microbiology	100	100	200
Core M2	Immunology	100	100	200
Core M3	Clinical Laboratory postings	---	---	---
Practicals				
Module M1& M2	Serological techniques, Media preparation, Culture techniques, Staining	100	100	200
Non -Core subjects				
		Theory	Practicals	total
Allied 1	Research methodology & Bioethics	50	---	50
General Electives	Soft skills / Teaching & Learning methodology	50	---	50

- There will be no separate examination for Core M3 - Clinical Laboratory postings.
- 10-15% of questions in theory paper of Core M1 & M2 shall be from clinical laboratory training material.

Fourth Semester- JSSAHER Examination				
Theory Examination				
Category	Subjects	IA	Final Exam	Total
Core M4	Bacteriology	100	100	200
Core M5	Bacteriology (40%) & Parasitology (60%)	100	100	200
Core M6	Clinical Laboratory postings	---	---	---

Practicals				
Module M3 & M4	Pure culture processing, Mixed culture processing, Serological tests for infectious diseases. Stool examination, Peripheral smear examination, antigen detection for malarial parasites,	100 (50+50)	100 (50+50)	200
Non -Core subjects				
		Theory	Practical	Total
Allied 2	Biostatistics	50	---	50
DSE	Immunofluorescence/ Environmental surveillance	50	---	50

- There will be no separate examination for Core M6 - Clinical Laboratory postings.
- 10-15% of questions in theory paper of Core M4 & M5 shall be from clinical laboratory training material.

Fifth Semester- JSSAHER Examination				
Theory Examination				
Category	Subjects	IA	Final Exam	Total
Core M7	Virology	100	100	200
Core M8	Mycology	100	100	200
Core M9	Clinical Laboratory postings	---	---	---
Practicals				
Module5 & 6	Serological techniques in Virology – ICT, Viral serology - CLIA, ELISA. Fungal stain preparation, Fungal media preparation and QC, Identification of Fungi - yeasts, mould, Slide culture techniques.	100 (50+50)	100 (50+50)	200
Non -Core subjects				
		Theory	Practicals	total
Skill enhancement	Industry exposure report	---	---	50
DSE	Laboratory accreditation/ Molecular techniques.	50	---	50

- There will be no separate examination for Core M9 - Clinical Laboratory postings.
- 10-15% of questions in theory paper of Core M7 & M8 shall be from clinical laboratory training material.

Medical Microbiology: Sixth semester

Category	Marks
Project work	100
Subject Viva Voce	70
Pedagogy	30

11. Appointment of examiners:

There shall be at least two examiners in theory and practical examination. Any staff with MD or MSc, PhD degree with 3 years of teaching experience is eligible to become examiners.

12. Criteria for declaring as pass in JSSAHER examination

Candidate should secure minimum 50% marks in each subject Theory including IA marks and Practicals including IA Marks separately to declare pass both in core and non – core papers.

Theory and Practical shall be considered as separate course. If a candidate passes in practical examination but fails in theory paper, such candidate is exempted from reappearing for practical but shall have to appear for theory paper in which subject paper candidate in has failed the subsequent examinations or vice versa.

Those candidates who failed in one or more subjects shall have to appear only in the subject so failed, in the subsequent examinations

A candidate securing less than 50% of marks as described above shall be declared to have failed in the examination. Failed candidate may appear in subsequent examination upon payment of examination fee to the JSSAHER.

13. Grading of performances

Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course.

Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent

70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any subject(s) in the end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the same in due course.

The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). It is the ratio of total credit points secured by a student in various courses in a semester and the total course credits of that semester. It shall be expressed up to two decimal places. The credit point (CP) of a course is equal to Credits (C) x Grade Point (G). Total Credit Point of a semester is sum of credit points (CP) of all courses of that semester.

Thus the SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses in a semester and the sum of the number of credits of all the courses in that semester, i.e

$$SGPA = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

Where C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

For example, if a student takes five courses (Theory/Practical) in a semester with credits C_1, C_2, C_3, C_4 and C_5 and the student's grade points in these courses are G_1, G_2, G_3, G_4 and G_5 , respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA shall be expressed up to two decimal places. The SGPA for each semester shall be calculated and awarded only for those students who have passed all the courses of that semester.

Cumulative Grade Point Average (CGPA)

It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places. CGPA shall be awarded only on successful completion of the programme (all eight semesters) and it is given in final semester grade report card/final transcript.

CGPA shall be calculated as follows:

$$\text{CGPA} = \frac{CP_1 + CP_2 + CP_3 + CP_4 + CP_5 + CP_6}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6}$$

Where CP_1, CP_2, CP_3, \dots is the total credit points for semester I, II, III, and C_1, C_2, C_3, \dots is the total number of credits for semester I, II, III,

14. Declaration of class

Class shall be awarded only on successful completion of the programme (all eight semesters) and it is given in final semester grade report card/final transcript. The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction = CGPA of 8.00 and above

First Class = CGPA of 7.00 to 7.99

Second Class = CGPA of 6.00 to 6.99

The candidates who secure a CGPA of 8.00 or above and have passed in all the subjects in all the semesters in first attempt shall be declared to have obtained First Class with Distinction.

15. Carry over system: A candidate who has failed in one or more subject in the First semester JSSAHER examinations can be permitted to enter II semester and so on. However, candidate should have passed JSSAHER examinations of all core and non- core papers from first to fifth semester to appear for Sixth semester examinations.

16. Award of Degree

A candidate who has passed all the subjects of I semester to VI Semester shall be eligible for award of Degree

17. Award of Ranks/Medals

Ranks and medals shall be awarded on the basis of final CGPA. However candidates who fail in one or more courses during the programme shall not be eligible for the award of ranks.

18. Duration for completion of the course of study

The duration for the completion of the course shall be fixed as double the actual duration of the course and the students have to pass within the said period, otherwise they have to get fresh Registration.

19. Revaluation I Retotalling of answer papers

There is no provision for revaluation of the answer papers of failed candidates in any examination. However, the failed candidates can apply for retotalling.

20. Re-admission after break of study

Candidate who seeks re-admission to the course after break of study has to get the approval from the JSSAHER by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she have to rejoin the course by paying the required fees.

MSc Medical Microbiology

Objectives

MSc post-graduate in Microbiology should understand the theory and practical aspects of:

1. Sterilization and disinfection their applications.
2. Antimicrobial agents, mechanism of action, resistance detection methods and susceptibility methods. (Phenotypic and Genotypic)
3. Quality control and Quality assurance in diagnostic microbiology
4. The morphology, pathogenesis, laboratory diagnosis, treatment and prevention of various medically important microbial infections.
5. LIS (Lab information system) and pre-analytical, analytical and post analytical procedures
6. Application of basic science knowledge and various research methodologies in biomedical, operational and translational research.

Programme outcomes:

After completing the three years of MSc in Medical Microbiology, the post graduate should be able to:

1. Emerge as qualified technologists and medical teachers
2. Carry out clinical lab investigations & instrument maintenance
3. Perform Quality control procedures in the lab and develop required knowledge/skills towards accreditation of labs.
4. Competent to work in research labs to pursue Ph.D.

First Semester

Core 1: Anatomy I- General anatomy, general histology, general embryology, and thorax

Specific Learning Objectives: During the course of the study students should be able to

1. Describe & demonstrate normal anatomical position, various planes, relation,
2. comparison, laterality & movement in our body
3. Describe the parts, blood and nerve supply of a long bone
4. Describe various joints with subtypes and examples
5. Describe superficial fascia & deep fascia along with fat distribution in body
6. Describe & differentiate between blood vascular and lymphatic system
7. Describe & demonstrate the microscopic structure of epithelial tissue, skin, blood vessels, connective tissue, cartilages, bones, nervous tissue, muscular tissue, salivary glands & lymphatic tissue
8. Describe & demonstrate the first 8 weeks of development of embryo with its anomalies
9. Describe & demonstrate the structures of thorax

THEORY

40 hrs

1. General anatomy

(10 hrs)

- a. Introduction: Anatomical terms & terminology/body regions.
- b. Connective tissue
- c. Bones.
- d. Muscles.
- e. Joints.
- f. Blood vessels & Lymphatic system.
- g. Nervous system.
- h. Blood vessels and nerves of upper limb
- i. Blood vessels and nerves of lower limb.
- j. Musculoskeletal system: Names of muscles & bones of upper & lower limb

2. General histology

(10 hrs)

- a. Histology of Epithelium.
- b. Histology of Connective tissue & Cartilages.
- c. Histology of Muscles.
- d. Histology of bones.
- e. Histology of blood vessels.
- f. Histology of lymph node & spleen.
- g. Histology of Tonsil & thymus.
- h. Histology of nervous tissue & Ganglia
- i. Histology of skin.
- j. Histology of salivary glands.

3. General Embryology

(10 hrs)

- a. Gametogenesis.
- b. Fertilization, cleavage & Implantation.
- c. Second week of development.
- d. Third week of development (Gastrulation, notochord, allantois)
- e. Fourth week of development
- f. Fetal membranes
- g. Development of Placenta
- h. Teratogens & Developmental anomalies
- i. Genetics: Introduction, Chromosomes, Inheritance, Karyotyping & Chromosomal abnormalities. (2Hrs)

4. Thorax

(10 hrs)

- a. Thoracic wall & intercostal spaces & muscles (01 hr)
- b. Mediastinum (01hrs)
- c. Lungs, trachea & Pleura (02hrs)
- d. Heart & pericardium (02hrs)
- e. Diaphragm (01hr)
- f. Histology of trachea & lungs (01 hr)
- g. Histology of GIT, Liver, gall bladder, pancreas (02hrs)

5. Module I: Anatomy (Practicals)

30 hrs.

Demonstration of bones of limbs (02 hrs)

Demonstration of slides of general Histology and slides of trachea & lung, GIT, Liver & gall bladder (10 hrs)

Embryology models (02 hrs)

Demonstration of bones of Thorax (2 hrs)

Demonstration of thoracic wall & mediastinum (02 hrs)

Demonstration of pleura, lung & trachea (06 hrs)

Demonstration of pericardium & heart (06 hrs)

Practical Evaluation: 100 **marks**

Description	Marks
Spotters: 20*2mark	40
Gross specimen discussion: 2*20 marks	40
Histology Slide discussion: 1*20marks	20
Total	100

A. RECOMMENDED TEXT BOOKS

Gross Anatomy:

1. Dutta A.K. Human Anatomy vol. I-III, Current publisher.
2. Dutta A.K. Principle of General Anatomy. Current Publisher.
3. Keith and Moore Clinical Oriented Anatomy. Lippincot Williams and Willkins.
4. Vishram Singh. Textbook of general anatomy. Elsevier.
5. Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.

Histology:

1. Difiore's. Atlas of histology with functional co-relation.
2. Text book of histology Inderbir Singh

Genetics:

1. Medical genetics by SD GANGANE

Embryology:

1. Human Embryology by INDERBIR SINGH
2. Vishram singh Textbook of clinical Embryology

Core 2- Physiology I

Specific Learning Objectives: During the course of the study students should be able to

1. Describe the structure and functions of cell, cell membrane & cell organelles, Transport across cell membrane and membrane potentials.
2. Describe the composition, formation and functions of different blood components
3. Describe the structure & properties of nerve and different types of muscle.
8. Describe the mechanism of muscle contraction
4. Describe the composition, functions and regulation of secretions of GIT and describe the movements of GIT.
5. Describe the mechanism of formation of urine and micturition process
6. Describe the electrical events, mechanical events and haemodynamics of cardiovascular system

Theory

40hrs

I. GENERAL PHYSIOLOGY

04hours

1. Organization of the cell, Cell membrane & its function, cell organelles
2. Intercellular communications
3. Transport across cell membrane
4. Membrane potentials – RMP & Action potential

5. Body fluid compartments
6. Homeostasis, concepts of physiological norms, range and variations.

II. BLOOD

08 Hours

1. Composition and functions of blood, Plasma Proteins
2. Red Blood cells – Erythropoiesis, Morphology of RBC, Functions, Normal values, Variations, PCV and ESR
3. Haemoglobin - Structure, Functions, Types, Derivatives.
4. Life span and destruction of RBC & Haemoglobin, Jaundice
5. Leucocytes – Leucopoiesis, Morphology of different types of leucocytes, functions, Variations, Humoral & Cell mediated Immunity
6. Platelets – thrombopoiesis, morphology, functions, normal values & Variation.
7. Hemostasis and blood coagulation – definition, clotting factors.
7. Mechanism of clotting, Bleeding disorders, anticoagulants
8. Blood groups – ABO system and Rh factor. Blood transfusion

III. NERVE AND MUSCLE PHYSIOLOGY

05 Hours

1. Structure of a neuron and classification of nerve fibers, Properties, Degeneration and regeneration of nerve fibers, Neuroglia.
2. Muscle: Types, Structure of skeletal muscle.
3. Neuromuscular junction and transmission across it
4. Mechanism of muscle contraction and its molecular basis. Types of contraction- isotonic and isometric contractions.
5. Types of skeletal muscle fibres
6. Energetics of muscle contraction– Rigor mortis.
7. Smooth muscle – Structure & Mechanism of contraction

IV. GASTROINTESTINAL SYSTEM

06 Hours

1. Introduction – Anatomy of G.I. tract, composition, functions of saliva
2. Mastication & Deglutition
3. Stomach – Compositions, functions of gastric juice, Mechanism of secretion of HCl, Gastric Motility
4. Exocrine pancreas – Compositions, functions of Pancreatic juice.
5. Liver and gall bladder – Function of liver, Composition and functions of bile. Function of gall bladder,
6. Small intestine – Composition and functions of succus entericus , Small intestine movements.
7. Large intestine – Functions and motility

V. RENAL SYSTEM , SKIN AND TEMPERATURE REGUALTION 07 Hours

1. Functional anatomy of kidney, Types of nephrons, JG Apparatus and Renal blood flow , Non excretory functions of kidney.
2. G.F.R- Definition, Mechanism of filtration and its regulation.

3. Tubular function – Glucose, Water, Sodium and Chloride Reabsorption, concentration mechanism of urine, acidification of urine
4. Micturition and Cystometrogram, Renal function tests.
5. Skin & its functions and temperature.

VI CARDIO VASCULAR SYSTEM

10 Hours

1. Functional anatomy of heart, Properties of cardiac muscle, Innervation of the heart
2. Conducting system of Heart, Origin & Spread of cardiac impulse, ECG
3. Cardiac cycle.
4. Heart rate and regulation of heart rate.
5. Cardiac output definitions, variations, Regulation .
6. Blood flow & factors affecting it.
7. Blood pressure – Normal values, measurement, factors affecting and regulation
8. Regional circulation – coronary
9. Shock, Cardiopulmonary resuscitation
10. Cardio vascular changes during muscular exercises.

Practicals:
01 credit

30 hrs

Module 2: Physiology I

- | | |
|--|--------|
| 1. Study of the microscope & Effect of different concentrations of Saline on RBC | 04 hrs |
| 2. Haemoglobin estimation | 06 hrs |
| 3. Study of Hemocytometer | 02 hrs |
| 4. Enumeration of Red Cell Count | 08 hrs |
| 5. Demonstration of Packed cell volume and ESR | 02 hrs |
| 6. Determination of Bleeding time and clotting time | 06 hrs |
| 7. Demonstration of ECG | 02hrs |

Practicals Evaluation: 100 Marks Haematology

- Major - 50 marks
- Minor - 30 marks
- Spotters - 20 marks

VII. RECOMMENDED TEXT AND REFERENCE BOOKS TEXT BOOKS

1. A K JAIN - Complete Medical Physiology Avichal Publishers Delhi
2. INDU KHURANA - Textbook of Physiology for Undergraduates, Elsevier,
3. Venktesh & Sudhakar

REFERENCE BOOKS

1. GUYTON & HALL - Text of Physiology, Elsevier, 13th Edition
2. GANONG's Review of Medical Physiology, Lange Publications, 27th edition

PRACTICAL MANUALS

1. G.K.PAL – Textbook of Practical Physiology – University Press
2. A.K.JAIN - Manual of Practical Physiology, Arya` Publishers Delhi

CORE 3: GENERAL BIOCHEMISTRY

Specific Learning objectives:

During the study students shall be able to Understand the principles and structure, functional and interaction of biomolecules.

Understand the properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins and glycolipids and their importance in biological systems
Understand the basic concepts of enzymes, vitamins, and minerals along with their role in metabolizing biomolecules.

Theory

40 hrs

UNIT – I: INTRODUCTION TO MEDICAL BIOCHEMISTRY (2 hrs)

Importance and scope of medical biochemistry in prevention, diagnosis, and therapeutics of diseases.

UNIT-II Cell Biology and Cell membrane (4 hrs)

structure and composition. Functions of cellular structures. Transport across the cell membrane i. Facilitated diffusion ii. Passive transport iii. Active transport iv. Receptor mediation v. Endocytosis and exocytosis

Membrane transport: Simple diffusion, Facilitated diffusion, Active transport (primary and secondary), Passive transport, Symport, Uniport and Antiport. Exocytosis, Endocytosis, Pinocytosis and Receptor mediation transport.

UNIT – III: CARBOHYDRATES CHEMISTRY (4 hrs)

Carbohydrates: Definition, Biological importance of Carbohydrates. Optical and Stereoisomerism of sugars. Mutarotation, Cyclic structure, Epimers and Anomers. Monosaccharides -Classification, Structure and Biological importance of Trioses, Tetroses, Pentoses and Hexose sugars; Reactions of sugars. Disaccharides - Structure and Biological importance of Sucrose, Lactose and Maltose. Polysaccharides: Homopolysaccharides; Structure, Biological functions of Starch, Glycogen, Cellulose. Chitin, Dextrin, and Inulin. Heteropolysaccharides; Structure, Biological functions of Hyaluronic acid, Chondroitin sulphate and Heparin.

UNIT – IV: LIPIDS CHEMISTRY (4hrs)

Definition, Classification and Biological importance of lipids. Simple lipids, Properties and Characterization of fats – Hydrolysis, Saponification, Rancidity. Compound lipids - Structure and function of phospholipids -Lecithin, Sphingomyelin, Cephalin, Phosphatidyl Inositol and Phosphatidylserine. Glycolipids (Gangliosides and

Cerebrosides). Derived lipids - Classification, structure, and properties of saturated and unsaturated fatty acids; Essential and Non-essential fatty acids. Sterols – Structure, Function and Properties of Cholesterol, Bile acids and lipoproteins biological importance and significance. Eicosanoids, Prostaglandins, Leukotrienes and Thromboxanes

UNIT – V: AMINOACIDS AND PROTEINS (4 hrs)

Amino acids: Definition, Amino acids. Structure and classification of amino acids, Chemical reaction of amino acids. Essential and Non-essential amino acids. Naturally occurring peptides-Glutathione, bradykinin. Peptide bond: Structure and significance of peptide bond, amino acid sequencing (Sanger's and Edman methods). Protein structure: Levels of structure in Protein Architecture, Primary structure of proteins (Eg. Insulin), Secondary structure of proteins – helix and β -pleated sheet, fibrous proteins; α -keratins, collagen. Tertiary structure of proteins (Eg. Myoglobin), Protein folding. Quaternary structure of proteins (Eg. Haemoglobin), globular proteins. Bonds stabilizing the Protein structure. Plasma proteins and its biological importance

UNIT – VI: NUCLEIC ACIDS CHEMISTRY (4 hrs)

Properties of purines, pyrimidines. Nucleosides, nucleotides. Functions of nucleotides. DNA: base composition, primary and secondary structure. Double helical structure (B, A and Z forms); stabilizing forces secondary structure. Tertiary structure of DNA. Physicochemical properties of nucleic acid: denaturation. Chemical and enzymatic hydrolysis of nucleic acids. Hybridization and its significance. Isolation of nucleic acids. RNA and its types: Structure, types mRNA, tRNA and rRNA. Primary, secondary, and tertiary structure of tRNA. Functions of RNAs.

UNIT – VII: ENZYMES (6 hrs)

Enzyme definition and classification, nomenclature, Properties, specificity, cofactors and coenzymes, K_m value, factors influencing velocity of enzyme action, inhibition of Enzyme catalysed reactions, Mechanism of enzyme action, enzyme kinetics, regulation of enzyme action, isoenzymes, clinical enzymology. Immobilized enzymes- applications, Diagnostics, Therapeutics, and analytical use of Enzymes

UNIT – VIII: VITAMINS AND MINERALS (6hrs)

Classification of Vitamins - Fat soluble and water soluble. Dietary source, structures, RDA, functions, and deficiency states. Macro and micro elements – Dietary source, structures, RDA, functions and deficiency of Iron, calcium, phosphorus, magnesium, iodine, Zinc, and copper.

UNIT – IX: NUTRITION (4hrs)

Nutrients, Calorific value of food, BMR, SDA, respiratory quotient, and its applications. Balanced diet based on age, sex and activity, biological value of proteins, nitrogen balance. Dietary fibres, and its biological importance. Protein energy malnutrition

- kwashiorkor and marasmus. Biochemistry of obesity. Dietetics, Total parenteral nutrition, Nutritional disorders.

UNIT –X FREE RADICALS AND ANTIOXIDENTS (2 hrs)

Formation of reactive oxygen species, Exogenous causes of formation of Free Radicals, Antioxidants

SEMESTER I – PRACTICALS (30 Hrs)

MODULE-3A- Basic biochemistry experiments PART-I

QUALITATIVE ANALYSIS OF SUBSTANCE OF PHYSIOLOGICAL IMPORTANCE 15 Hrs

1. Introduction to Biochemistry Practical's.
2. Qualitative analysis of carbohydrates-
3. Qualitative analysis of amino acids
4. Qualitative analysis of lipids
5. Reactions of NPN substances
6. Identification of substance of physiological importance

MODULE-3A-PART-II

QUANTITATIVE ESTIMATIONS 15 Hrs

1. Estimation of serum total protein
2. Principles of colorimetry & spectrophotometry
3. Estimation of glucose by GOD-POD method.
4. Estimation of blood urea by DAM method
5. Estimation of urine creatinine.

Practical Evaluation B1 & B2-100 marks

1. Spotters-Reagents, Tests, Glassware's., Instruments, equipments- 20 marks
2. Qualitative analysis of substance of physiological importance & interpretation- 40 marks
3. Quantitative estimation & interpretation- 40 marks

Recommended books

1. DL Nelson and MM Cox (2013) Lehninger, Principles of Biochemistry, WH Freeman Publication, 6th Edition
2. D Voet and JG Voet (2010) Biochemistry, John Willey & Sons Publication, 4th Edition
3. T. Palmer (2004) Enzymes: Biochemistry, biotechnology, clinical chemistry; 9. Affiliated East West Press Private Limited.
4. L. Stryer (2002) Biochemistry; W H Freeman & Co., 5th edition.
5. Robert A. Weinberg, The Biology of Cancer, Garland Science; 2nd edition, 2013

Non- Core Subjects

General Electives-Yoga/Music Yoga

INTRODUCTION

Yoga has gained acceptance and popularity across the Globe. It offers solace for the restless mind and a traditional and time-tested way of keeping the mind and body fit. Some use it for developing memory, intelligence and creativity. With its multi fold advantages it is becoming a part of education as a mandate or elective course. Specialists use it to unfold deeper layers of consciousness in their move towards perfection.

OBJECTIVES

In this unit you will be learning the benefits of yoga at the muscular level, breathing level, mental level, intellectual level, emotional level and the manifestations of divinity in all walks of life and the yoga way of life taking man from animal level to perfection. The application of yoga in health, in warding off executive tensions also mentioned along with work for practitioner of yoga.

BENEFITS AS MENTIONED IN YOGASUTRAS, HATHA YOGA ETC.:-

Yoga is a process of all-round personality development by

1. Deep relaxation at muscular level,
2. Slowing down of breath and maintaining balance at Pranic Level,
3. Increasing the intellect and calming down the mind at intellectual level,
4. Sharpening the intellect and calming down the mind at intellectual level,
5. Enhancing the happiness in life and equipoise at emotional level, and
6. Manifesting the innate divinity in man in all aspects of life.

Loosening Exercises Stage I: Slow Jogging Stage II: Backward Jogging Stage III: Forward Jogging Stage IV: Side Jogging
Stage V: Mukha Dhauti to relax Forward and Backward Bending Side Bending
Twisting Suryanamaskara

Asanas in Standing Postures

Tadasana
Vrukshasana
Ardhakati Chakrasana
Ardha Chakrasana
Pada Hastasana

Asanas in Sitting Postures

Vajrasana
Ustrasana
Pascimottanasana

Asanas in Prone Postures

Bhujangasana

Salabhasana

Asanas in Supine Postures

Sarvangasana Halasana

Shavasana (Quick Relaxation Technique)

Assessment plan Theory: 25 marks

Short essay- 3 questions x 5 marks = 15 marks Short answers- 5 questions x 2 marks= 10 marks

Practicals- 25 marks

Performing any two Asanas- 25 marks

Music

Syllabus and teaching plan

Unit 1	Brief introduction to Indian Music Knowledge of technical terms; Naada, Shruthi, Swara			
Unit 2	Knowledge of Laya, Taala, sulaadisapthataala Classification of musical instruments			
Unit 3	Music as medicine			
Unit 4	Basic lesson 1 Sarale Varase - 4, Janti Varase - 1			
Unit 5	Basic lesson 2 Pillari Geethe - 1, Sanchari Geethe - 1			
Unit 6	Patriotic song, Bhajan			
Unit 7	Devaranaama, Bhaavageethe			
Unit 8	Vachana			
Gen Elective - Music	Hours Per week	Theory Evaluation	Practical evaluation	Total Marks
	2	25	25	50

Semester 2

Core 4: Anatomy II- Abdomen, Pelvis, Head & Neck and Systemic histology

Specific learning Objectives: At end of the semester students should be able to

1. Describe & demonstrate the structures of abdominal organs
2. Describe & demonstrate the anterior and posterior abdominal wall
3. Describe & demonstrate the structures of pelvis & perineum
4. Describe & demonstrate the structures of head & neck
5. Describe the parts of brain and spinal cord, Blood supply of brain & spinal cord and Cranial nerves
6. Describe & demonstrate the microscopic structure of abdominal organs, pelvic organs & head & neck organs

(Theory)

I. Abdomen & pelvis

- | | |
|--|----------|
| a. Anterior abdominal wall & Inguinal Region | (01 hr) |
| b. Posterior abdominal wall | (01 hr) |
| c. Peritoneal cavity and Peritoneum | (01 hr) |
| d. GIT: Stomach, Duodenum, Jejunum and Ileum, Cecum and Appendix, & spleen | (04 hrs) |

**40 hours
(20 hrs)**

- e. Pancreas, Liver, Extra hepatic biliary apparatus, Portal venous system (02 hrs)
- f. Urinary system: Kidney, Urinary bladder, Urethra (02 hrs)
- g. Supra renal gland (01 hr)
- h. Male genital system (02 hrs)
- i. Female genital system (02hrs)
- j. Anal canal & rectum (01 hr)
- k. Perineal pouches (01hr)
- l. Ischiorectal fossa (01hr)
- m. Internal & external iliac arteries (01hr)

II. Head & neck: (16 hrs)

- a. Scalp (01hr)
- b. Face: Muscles of Facial expression, facial artery, Parotid region with parotid gland (01hr)
- c. Neck: Anterior Triangle of the Neck, Posterior Triangle of the Neck, Thyroid and parathyroid gland, Sub-occipital region (03hrs)
- d. Temporal & infra-temporal regions & TM Joint (02hrs)
- e. Submandibular region (01hr)
- f. Interior of skull: Dural venous sinuses and Pituitary gland, Orbit and extra ocular muscles (02hrs)
- g. Cut section of Neck: Oral Cavity and Tongue, Nose and nasal cavity, Paranasal air sinuses, Pharynx, Larynx, Auditory tube & palatine tonsil (04hrs)
- h. Central nervous system: Parts of brain and spinal cord, Blood supply of brain & spinal cord, Cranial nerves (02hr)

III. Systemic histology (04 hrs)

- a. Histology of Kidney, ureter, urinary bladder
- b. Histology of male & female genital system: uterus, uterine tube, ovary, testis, prostate, epididymis
- c. Histology of tongue, retina & cornea.
- d. Histology of Endocrine glands: Thyroid, suprarenal, pituitary

Practical: 30hrs.

- a. Demonstration of lumbar vertebrae, bony pelvis (02 hrs)
- b. Demonstration of slides of Histology and slides of Kidney, ureter, urinary bladder, Male & female genital system, Tongue, Retina & cornea, Thyroid , suprarenal & pituitary gland (06 hrs)
- c. Demonstration of organs of abdomen & pelvis (20 hrs)
- d. Demonstration of anterior & posterior abdominal wall (02hrs)

Practical Evaluation: 100 marks

Description	Marks
Spotters: 20*2mark	40
Gross specimen discussion: 2*20 marks	40
Histology Slide discussion: 1*20marks	20
Total	100

RECOMMENDED TEXT BOOKS

Gross Anatomy:

- Dutta A.K. Human Anatomy vol. I-III, Current publisher.
- Dutta A.K. Principle of General Anatomy. Current Publisher.
- Keith and Moore Clinical Oriented Anatomy. Lippincot Williams and Willkins.
- Vishram Singh. Textbook of general anatomy. Elsevier.
- Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.

Histology:

1. Difiore's. Atlas of histology with functional co-relation.
2. Text book of histology Inderbir Singh

Genetics:

1. Medical genetics by SD GANGANE

Embryology:

1. Human Embryology by INDERBIR SINGH
2. Vishram singh Textbook of clinical Embryology

Core 5- Physiology II

Specific learning Objectives: During the course of the study students should be able to

1. Describe the mechanics of breathing, diffusion & transport of gases, regulation of respiration and applied aspects.
2. Describe the synthesis, actions and regulation of secretion of various endocrine hormones
3. Describe the structure and function of male & female reproductive system
4. Describe the mechanism of perception of sensations and motor control
5. Describe the structure and mechanism of special sensations.

Theory: 40 hrs

I. RESPIRATORY SYSTEM

08 Hours

1. Introduction – Functional anatomy of respiratory system
2. Pulmonary Ventilation – Mechanism of ventilation, Muscles, pressure changes, Lung volume & capacities Surfactant , compliance, Airway resistance.
3. Alveolar ventilation, dead space ventilation, Ventilation Perfusion ratio
4. Respiratory membrane, partial pressure of gases. Diffusion of gases and factors affecting it.
5. Oxygen transport – O₂ –Hb dissociation curve and CO₂ transport
6. Regulation of respiration – Neural & Chemical
7. Hypoxia - types, Periodic breathing.
8. Decompression sickness
9. Respiratory adjustments during muscular exercise.

II ENDOCRINES

08 Hours

1. Introduction to endocrinology, classification and mechanism of action of hormones.
2. Pituitary gland:
 - Anterior pituitary hormones, their actions, Regulation of secretion and disorders,
 - Posterior pituitary hormones - Actions, Control and disorders
3. Thyroid hormones - Synthesis, actions, Regulation of secretion and disorders
4. Parathyroid hormones - Actions, Regulation of secretion and disorders
5. Calcium homeostasis
6. Endocrine pancreas – Insulin & Glucagon.
 - a) Source b) Actions c) regulation d) Clinical disorders
7. Adrenal gland:
 - Adrenal cortical hormones – Actions, Regulation and Disorders.
 - Adrenal medullary hormones – actions

III REPRODUCTIVE SYTEM

06 Hours

1. Introduction.
2. Male reproductive system
 - Physiological anatomy, spermatogenesis and its regulation
 - Testosterone, compositon of semen.
3. Female reproductive system
 - Oogenesis, Oestrogen & Progesterone
 - Menstrual cycle
 - Physiology of Pregnancy
 - Contraceptive measures

IV. CENTRAL NERVOUS SYSTEM

12 Hours

1. Organization of central nervous system
2. Synapse: Transmission and properties, excitatory and inhibitory neurotransmitters
3. Receptors and properties
4. Sensory system: Primary sensations : ascending tracts and sensory cortex
5. Pain sensation and thalamus
6. Spinal cord: Reflexes.
7. Pyramidal and extra pyramidal tracts
8. Functions of Basal ganglia, Cerebellum and Vestibular apparatus.
9. Functions of hypothalamus, ANS, Limbic system
10. Sleep and EEG
11. CSF and blood brain barrier (BBB)

V. SPECIAL SENSES Vision:

1. Functional anatomy, Aqueous humor & IOP
2. Image forming mechanism, Errors of refractions
3. Retina – structure and Photochemistry of vision
4. Visual activity, Visual pathway and its lesion , visual cortex
5. Accommodation, Dark adaptation, Pupillary reflexes,
6. Colour vision

Hearing :

1. Functional anatomy of Ear
2. Role of tympanic membrane, middle ear and cochlea in hearing.
3. Auditory pathway and auditory cortex.
4. Tests for hearing and deafness.

Taste and smell: Modalities, receptors, pathways

Practical: 30 hrs

Module 4: Physiology

- | | |
|---------------------------------|--------|
| 1. Total Leucocyte count | 06 hrs |
| 2. Differential leucocyte count | 12 hrs |

3. Absolute Eosinophil count	06 hrs
4. Blood grouping	04 hrs
5. Demonstration of Spirometry	02 hrs

Practicals evaluation: 100 Marks Haematology

- Major - 50 marks
- Minor - 30 marks
- Spotters - 20 marks

RECOMMENDED TEXT AND REFERENCE BOOKS

TEXT BOOKS

- A K JAIN - Complete Medical Physiology Avichal Publishers Delhi
- INDU KHURANA - Textbook of Physiology for Undergraduates, Elsevier,
- Venkatesh & Sudhakar

REFERENCE BOOKS

- GUYTON & HALL - Text of Physiology, Elsevier, 13th Edition
- GANONG's Review of Medical Physiology, Lange Publications, 27th edition

PRACTICAL MANUALS

- G.K.PAL – Textbook of Practical Physiology – University Press
- A.K.JAIN - Manual of Practical Physiology, Arya` Publishers Delhi

CORE 6: ENERGY METABOLISM AND METABOLISM OF BIOMOLECULES

Specific Learning objectives:

1. Students will understand the role of High energy compounds, Importance of reducing equivalents Electron transport chain and Oxidative Phosphorylation.
2. Students will understand the process of Digestion and absorption of Carbohydrates, Lipids and Proteins with associated disorders.
3. Students will understand the synthesis and utilisation of Carbohydrates, Specialised pathways, Glucose tolerance and transport, Regulation of Blood Glucose and Diabetes Mellitus.
4. Students will understand the synthesis and utilisation of lipids including lipoprotein metabolism, regulation and associated Disorders
5. Students will learn about basic of molecular biology and immunology

Theory **40 hrs**

UNIT – I: BIOENERGETICS AND BIOLOGICAL OXIDATION **(2 hrs)**

Redox potential, concept of bioenergetics in relation to thermodynamics. High energy compounds. Enzymes involved with special reference to oxygenases. Shuttle

mechanisms. Components and organization of respiratory chain in mitochondria. Oxidative phosphorylation. Formation of ATP and its regulation. Inhibitors and uncouplers (Brown adipose tissue and thermogenesis)

UNIT – II: DIGESTION AND ABSORPTION

(3 hrs)

1. Carbohydrate
2. Lipids
3. Proteins
4. Malabsorption syndromes and other related disorders
5. Digestion: Digestion and absorption of Carbohydrates, proteins and fats. Role of gastro intestinal hormones in digestion.

UNIT – III: METABOLISM OF CARBOHYDRATES

(6 hrs)

Glucose transporters. Glycolysis. Oxidation of pyruvate. TCA cycle e. Gluconeogenesis, Cori's cycle, Metabolism of glycogen (glycogenesis, glycogenolysis, storage disorders). HMP shunt pathway. Metabolism of fructose, galactose, uronic acid pathway, inborn errors associated with them. Blood glucose regulation. Diabetes Mellitus-Etiology, metabolism in Diabetes Mellitus, biochemical basis of acute and chronic complications, laboratory diagnosis and monitoring (Glycated Hb,). Glucose tolerance test

UNIT – IV: METABOLISM OF AMINO ACIDS AND PROTEINS (6 hrs)

Dynamic state of body proteins, protein turnover, nitrogen balance. Cellular reactions of amino acids. Formation, transport and disposal of ammonia (urea cycle). Metabolism of amino acids – glycine, serine, aromatic amino acids, sulphur containing amino acids, histidine, arginine, glutamic acid, branched chain amino acids and metabolic disorders associated with them along with laboratory diagnosis. Specialized products obtained from amino acid metabolism and their importance (Polyamines, creatine, nitric oxide), one carbon metabolism

UNIT – V: METABOLISM OF LIPIDS

(6 hrs)

Oxidation of fatty acids – alpha, beta, omega – beta oxidation of odd chain and even chain fatty acids along with disorders. Formation and utilization of ketone bodies and ketosis. De novo synthesis of fatty acids, elongation and desaturation. Phospholipids (lecithin and cephalin only) and triglycerides – formation and breakdown. Lipid storage disorders. Synthesis of cholesterol, Fate of cholesterol and compounds derived from cholesterol. Lipoproteins – classification, metabolism, functions and disorders Atherosclerosis and role of PUFA in preventing atherosclerosis. Eicosanoids. Metabolism in adipose tissue, fatty liver and lipotrophic factors

UNIT – VI: METABOLISM OF NUCLEIC ACIDS

(2 hrs)

Biosynthesis and catabolism of purine and pyrimidine nucleotides. Salvage pathways and disorders

UNIT – VII: INTERMEDIARY METABOLISM (2 hrs)

Integration of carbohydrate, protein and lipid metabolism. Regulation by hormones in starvation, well fed state and diabetes mellitus. Methods of study of intermediary metabolism

UNIT – VIII: HEMOGLOBIN METABOLISM (6hrs)

Biosynthesis of heme, regulation and porphyrins. Breakdown of haemoglobin. Biochemical basis of jaundice and distinguishing features of different types of jaundice. Haemoglobin variants and Hb derivatives. Abnormal haemoglobins, hemoglobinopathies and thalassemia

UNIT – IX: GENETICS AND MOLECULAR BIOLOGY (4 hrs)

DNA replication. Transcription post transcriptional modifications, reverse transcriptase. Genetic code, translation, post translational modifications. Regulation of gene expression, mutation, Polymerase Chain Reaction, recombinant DNA technology, gene therapy, blotting techniques, Restriction Fragment Length Polymorphism, DNA fingerprinting

UNIT – X: IMMUNOLOGY (3 hrs)

Immune system, T & B lymphocytes, antigen presenting cells, humoral and cell mediated immunity, lymphokines, immune regulation, monoclonal antibodies, applications of immunological techniques, immunological disorders

SEMESTER II- PRACTICALS

Basic Biochemistry Experiments: Part -II

1. Qualitative analysis of urine and blood
 - Analysis of normal urine
 - Analysis of abnormal urine
 - Spectroscopic examination of Blood
2. Demonstration experiments
 - Chromatography
 - Electrophoresis
 - ELISA
3. Quantitative Experiments
 - Identification of unknown sample
 - Oral Glucose tolerance test
 - Determination of molar extinction coefficient of aromatic amino acids
 - Screening test for amino acids.
 - Estimation of serum creatinine by Jaffe's method & calculation of creatinine clearance.
 - Estimation of total cholesterol and HDL cholesterol CHOD-POD method

- Estimation of serum AST & ALT by Reitman & Fankel method
- Estimation of serum total & direct bilirubin
- Estimation of Uric acid in serum

Practical assessment plan- 100 marks

- | | |
|--|----------|
| 1. Spotters-Reagents, Tests, Glassware's., Instruments, equipments, demonstration experiments- | 20 marks |
| 2. Qualitative analysis of urine, blood & interpretation- | 40 marks |
| 3. Quantitative estimation & interpretation- | 40 marks |

Recommended books

1. Lehninger's Principles of Biochemistry, Nelson, David I. and Cox, 2000 M.M. Macmillan/ worth, .NY
2. Fundamentals Of Biochemistry, Donald Voet, Judith G.Voet and Charlotte W Pratt, 1999, John Wiley & Sons, NY
3. Outlines of Biochemistry, Eric E.Conn, P.K. Stumpf, G.Brueins and Ray H.Doi, 1987. John Wiley & Sons, NY
4. Biochemistry, Lubert stryer, 1994. 3rd Edn., W H freeman and co, Sanfrancisco.
5. Text book of biochemistry, Thomas M Devlin, 1997 4th edition ,A John Wiley, In
6. Principles of Biochemistry , Garrette & Grisham, 1994. Saunders college Publishing
7. Harper's Biochemistry, R.K. Murray and others, 25 ed 2009. Appleton and Lange, Stanford
8. Regulation in Metabolism , E.A.Newshome ,C. Start, John Wiley & Sons.

Non Core subjects

General electives- Humanities/Health economics Humanities

Specific Learning objectives: At the end of this paper the student should be able to,

1. Discuss concept and importance of health humanities in patient care practices
2. Describe various principles of health humanities in health care delivery
3. Demonstrate different components of health humanities in patient care
4. Develop and demonstrate the skills of reflective practice in health care delivery

Syllabus and teaching plan of health humanities

SI No	Title of the topic	No of hours	Method of instruction
1.	Introduction to health humanities	01	Lecture
2.	History of medicine	02	Lecture
3.	Understanding the self- What is me?	01	Games and discussion

4.	How to interpret situations	01	Games and discussion
5.	What it means to be sick	01	Role play Group discussion
6.	What it means to be a patient	01	Role play Group discussion
7.	What it means to be an attendant	01	Role play Group discussion
8.	Team building	01	Games and discussion
	Trusting the team	01	Games and discussion
9.	Communication skills – Verbal	02	Video, group discussion
10.	Communication skills – Non verbal	01	Video, group discussion
11.	Empathy – module 1	01	Games and discussion
12.	Empathy – module 2	01	Games and discussion
13.	Breaking the bad news	01	Video, role play, discussion
14.	Interpersonal relationships	02	Lecture, video, group discussion
15.	Leadership module -1	01	Video, group discussion
	Leadership module – 2	01	Role play and discussion
16.	Developing professional identity	02	Lecture
17.	Reflective thinking for action	02	Lecture and group discussion
18.	Ethics and humanities	02	Lecture and group discussion
19.	Practicing professionalism	02	Lecture and group discussion
20.	Theatre and Humanities	02	Theatre

Assessment plan

Formative: Reflective writing and active participation in the session

Summative examination for 50 marks

- MCQ – 10 Marks
- Reflective writing on a given scenario – 10 marks
- Short essays –3 questions of 5 marks each=15marks
- Short answers – 5 questions of 3 marks each=15marks

Health economics

- Specific learning objectives: At the end of the course, the student will be able to
- Explain basic economic theories and models of regulation which are applied to health care Sector
- Interpret and appropriately apply the key concepts of economics within the context of the health system Describe and apply key steps in critically reviewing economic evaluations and to understand their use in the decision-making process
- Understand and describe the main features of the Indian health system- in particular how it differs from other salient national health systems according to how services are delivered and purchased

Module 1 - Introduction to Economics

Introduction to economics, definition, scope, basic assumptions, economic analysis- micro, macro, positive and normative, short run, long run, equilibrium-partial, and general. Basic questions of economics, economic model-circular flow of economics, Production Possibility Curve.

Module 2 - Health Economics

Introduction, area of health economics, importance of health economics, scope, concept of health and health characteristics, need of health economics, uniqueness of health as goods and service, health and economic development, causes of health problems in India, economics evaluation methods-cost benefit, cost minimization, cost utility analysis.

Module 3 - Law of Demand

Introduction to demand, law of demand, demand in health care, elasticity in demand for health care, determinants of health care demand.

Module 4 - Law of Supply

Supply in health, law of supply, determinants of supply, elasticity of supply, relation of demand and supply.

Module 5 - Healthcare Innovation

Recent trends in Healthcare market, Start ups in Healthcare- Concepts and Cases, Health care technology from a business perspective.

Books for Reference:

1. Economics Principles and Applications (Indian Edition)-Gregory Mankiw
2. Managerial Economics Principles and World wide Applications- Dominic Salvatore, Sidhartha K Rastogi
3. Health Economics- N.K Anand and Shikha Goel Health Economics for Hospital Management- Shuvendu Bikash Dutta

Assessment Plan- Theory 50 marks

5 marks x 4 questions= 20 marks

2 marks x 15 questions=30 marks

SEMESTER 3

CORE: M1: GENERAL MICROBIOLOGY

Specific learning objectives: At the end of the course student will be able to

1. Understand the history of Microbiology. .
2. Understand the morphology, growth requirements and metabolism in bacteria
3. Students will study about different types of sterilization methods and its applications.
4. The methods of bacterial cultivation and identification.
5. Understand the mechanisms of drug resistance and their detection methods

Theory

40 hours

Topics

1. ORIENTATION, BIOMEDICAL WASTE MANAGEMENT AND UNIVERSAL SAFETY PRECAUTIONS

4Hrs

Orientation to the Medical microbiology course, General principles of waste management, Types and segregation of biomedical waste, Collection, transportation, disinfection and final disposal of biomedical waste, Salient features of Biomedical waste management rules. Occupational safety and Universal safety precautions to be followed in the laboratory

2. INTRODUCTION AND HISTORY

3Hrs

Contributors in Microbiology, Bacterial Taxonomy, Classification, Nomenclature and Type cultures

3. BACTERIAL MORPHOLOGY

4Hrs

Microscopy, Staining techniques, Size and shape of bacteria, Bacterial anatomy cell wall, cytoplasmic membrane, cytoplasm, ribosomes, mesosome, intracytoplasmic inclusions, nucleus, slime layer, capsule, flagella, fimbriae, spore, pleomorphism, involution forms and L forms

4. GROWTH AND NUTRITION

2Hrs

Cell division, Bacterial Growth, Bacterial growth curve, Bacterial counts, Factors affecting growth of bacteria

5. BACTERIAL GROWTH AND METABOLISM

2Hrs

Metabolism of Pathogenic bacteria – Fermentation & Oxidation

6. STERILISATION

7Hrs

Agents used for Sterilisation/Disinfection – Physical & Chemical agents
Physical agents: Sunlight, Drying, Heat, Filtration, Radiation, Ultrasonic & Sonic vibration
Gaseous sterilisation

New method of sterilizing of heat sensitive articles – Plasma sterilisation

7. DISINFECTION

4Hrs

Chemical agents: Alcohols, Aldehydes, Dyes, Halogens, Phenols, Gases, Surface-active agents, Metallic salts

Testing of Disinfectants, Spaulding's classification of medical devices, Central Sterile Service Department

8. CULTURE MEDIA AND METHODS

4Hrs

Culture media – Constituents of culture media; Types of culture media – Liquid, solid, simple, complex, synthetic and defined media; Special media- enriched, enrichment, selective, indicator, differential, sugar, transport and anaerobic media Culture methods- Methods of aerobic culture, anaerobic culture methods, Preservation of microorganisms, Methods of isolating bacteria in pure cultures.

9. IDENTIFICATION OF BACTERIA

4Hrs

Conventional methods – Based on morphology, staining, reactions, cultural characteristics, resistance, fermentation & other biochemical properties, antigenic structure. Automated culture techniques, Molecular methods and microbial typing – Phenotypic and genotypic methods

10. DRUG RESISTANT BACTERIA & ANTIBIOTIC SUSCEPTIBILITY TESTING METHODS

6Hrs

Principles of bacterial genetics, Gene transfer- transformation, transduction, lysogenic conversion & conjugation, Genetic mechanisms of drug resistance in bacteria, Gene transfer by artificial methods – Genetic engineering, nucleic acid probe and blotting techniques Mechanism of antimicrobial resistance, Antimicrobial susceptibility testing methods

Disk diffusion, dilution methods, automated methods and molecular methods of detection of drug resistance.

Recommended books:

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Medical Microbiology- Samuel Baron
4. Mackie & McCartney Practical Medical Microbiology
5. Bailey & Scott's- Diagnostic Microbiology
6. Introduction to Diagnostic Microbiology

CORE-M2: IMMUNOLOGY

Specific learning objectives: The students will be able to

1. Understand the different types of Infections.
2. understand the Classification and mechanism of Immunity
3. understand the structure and functions of immune system
4. understand the types and nature of Antigens and Antibodies
5. Understand the types and importance of antigen - antibody reactions.
6. the different types and mechanism of Immune response
7. The concept of Transplantation immunology and role of MHC.

Theory: 40 hrs

1. INFECTION (3hrs)

Definition, Classification, sources, types & modes of transmission, Factors predisposing to microbial pathogenicity, Types of infectious diseases

2. IMMUNITY (4hrs)

Definition, Types of immunity, innate immunity, acquired immunity and other types of immunity

3. ANTIGEN (2hrs)

Definition, Types & Biological classes of antigens, Properties and factors influencing immunogenicity

4. ANTIBODIES/ IMMUNOGLOBULINS (3hrs)

Definition, Properties, Structure, Types and functions of antibodies, monoclonal antibodies and abnormal immunoglobulins

5. ANTIGEN - ANTIBODY REACTIONS (5hrs)

Definition, Properties, types of antigen antibody reactions, Agglutination, Precipitation, Opsonization, Activation of complement, Neutralization and Labelled immune assays

6. COMPLEMENT SYSTEM (3hrs)

General properties, pathways, regulation of complement activation, deficiencies of complement system

7. STRUCTURE AND FUNCTIONS OF IMMUNE SYSTEM (5hrs)

central & peripheral lymphoid organs, cells of lymphoreticular system, T & B cell maturation, Null cells, MHC

8. IMMUNE RESPONSE (4hrs)

Humoral immune response and cell mediated immune response

9. HYPERSENSITIVITY**(5hrs)**

Definition & types of hypersensitivity reactions with examples and methods of detection

10. AUTOIMMUNITY**(3hrs)**

Definition, types, mechanisms, classification & pathogenesis of autoimmune diseases

11. TRANSPLANTATION AND TUMOR IMMUNOLOGY**(3hrs)**

Types of grafts, Histocompatibility antigens, Types of rejection, Graft versus host reaction Tumor antigens, Immune surveillance and immunotherapy

Recommended books:

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
4. Introduction to Diagnostic Microbiology- Elmer W Koneman et al

SEMESTER III – PRACTICALS

MODULE- M1 (30 Hrs)

1. PART A: SEROLOGICAL TECHNIQUES & MEDIA PREPARATION
2. Serological techniques- Latex agglutination tests (RA, CRP, ASO)
 - Media preparation
 - Liquid media (peptone water, Nutrient broth)
 - Solid Media (Blood agar, Chocolate agar, Mac Conkey agar, Muller hinton agar)
 - Selective media (Wilson & Blair, TCBS, HEA agar, XLD, DCA, PTA)
 - Enrichment media (Selenite F Broth)
 - Biochemical media (Urease, Citrate, TSI, BEA, DNase, Sugar fermentation media, Amino acids, OF Media, PPA, Nitrate broth, MR-VP broth)

MODULE- M2 (30 Hrs)

PART B: CULTURE TECHNIQUES & STAINING

1. Culture Techniques: Streak, Lawn, Stab culture
2. Staining Techniques: Simple staining, Gram staining, Acid fast staining, Alberts staining, Capsule/spore/ flagellar staining techniques.

Practical Examination: M1 & M2

Part A:

- | | |
|--|----------|
| 1. Principle, procedure and application of Latex agglutination tests | 10 marks |
| 2. Media preparation | 40 marks |
| • Solid media | 10 marks |
| • Selective media | 10 marks |
| • Biochemical media | 20 marks |

Part B:

- | | |
|-------------------------------------|----------|
| 1. Culture techniques demonstration | 20 marks |
| 2. Staining techniques | 30 marks |

Recommended books

1. Mackie & McCartney Practical Medical Microbiology
2. Bailey & Scott's- Diagnostic Microbiology
3. Introduction to Diagnostic Microbiology

Core M3- Clinical Laboratory postings

A. Sterilization, Media Preparation and quality control:

- Sterilization techniques and its applications in a tertiary care hospital
- CSSD

- Preparation of various culture media
- Quality control & quality assurance in Microbiology laboratory

B. Staining and Microscopy:

- Preparation of staining solutions
- Staining and microscopic observation:
- Simple staining,
- Gram Staining,
- Acid fast Staining,
- Albers Staining,
- Capsule/spore/flagellar staining techniques.

C. Serological Techniques:

- Observation, performing and interpretation of latex agglutination test
- RA
- CRP
- ASO

D. ELISA techniques:

- Observation of ELISA techniques
- Preparation of reagents/ buffers
- Stock solution preparation
- Procedural steps for ELISA
- Washing techniques
- Reading and interpretation of OD in ELISA reader

Recommended books

1. Mackie & McCartney Practical Medical Microbiology
2. Bailey & Scott's- Diagnostic Microbiology
3. Introduction to Diagnostic Microbiology

Non - Core Subjects
Allied-1- Research Methodology & Bioethics

Specific Learning objectives

At the end of this paper the student should be able to,

1. Describe the concept, uses and types of biomedical research
2. Discuss various steps involved in conducting the biomedical research
3. Describe various steps in developing research protocol and scientific communication
4. Describe concept and principles of ethics in biomedical research

Theory: 30hrs

Sl No	Title of the topic	No of hours	Method of instruction
1	Introduction to health research	01	Lecture
2	Identifying research topics	01	Lecture + Group discussion
3	Literature search with Hands on activity	02	Lecture Hands on exercise
4	Literature matrix	01	Lecture Hands on exercise
5	Writing research question and objectives	01	Lecture Hands on exercise
6	Study designs -1 – Descriptive studies	01	Lecture
7	Study designs -2 – Analytical studies	01	Lecture
8	Study designs -3 – Experimental studies	01	Lecture
9	Diagnostic validation studies	01	Lecture
10	Sampling techniques	01	Lecture Hands on exercise
11	Sample size estimation	01	Lecture Hands on exercise
12	Tools for data collection	01	Lecture

13	Designing and validation of a questionnaire	01	Lecture Hands on exercise
14	Describing study designs in molecular studies	01	Lecture
15	Animal experiments	01	Lecture
16	Role of statistics in research methodology	01	Lecture
17	Role of computers in health research	01	Lecture
18	Designing a research protocol	02	Workshop
19	Research to publication	01	Lecture
20	Funding opportunities and requirements	01	Lecture
21	Introduction to Bio ethics	01	Lecture
22	History and Principles of ethics	01	Lecture
23	Guidelines for research ethics	02	Lecture
24	ICH-GLP- GCP Guidelines	02	Lecture
25	Institutional Ethics Committee	01	Lecture
26	Informed consent	01	Lecture

Assessment plan

Formative : MCQ Based Tests, Unit tests

Summative examination for 50 marks

- MCQ – 10 Marks
- Writing research protocol for given problem statement – 20 marks
- Short essays –2 questions of 4 marks each=08marks
- Short answers – 4 questions of 3 marks each=12 marks

General electives
Soft skills/ Teaching learning Methodology

Soft skills

Specific learning objectives

At the end of this elective, the student should be able to,

1. Understand the importance of soft skills in health profession
2. Demonstrate the attributes of professionalism and soft skills in working environment
3. Understand the methods of problem solving and conflict management in work place
4. Understand and demonstrate the leadership skills in health care setting

Hrs: 30

Sl No	Title of the topic	No of hours	Method of instruction
1	Introduction to soft skills	01	Lecture
2	General soft skills	02	Lecture Video
3	Technical soft skills	01	Case scenario based Group discussion
4	Communication skills, written communication skills, skills of writing email	01	Video Group discussion
5	Critical and structured thinking, scientific presentation skills.	02	Group discussion
6	Problem solving skills	01	Case scenario based Group discussion
7	Creativity	01	Case scenario based Group discussion
8	Team work capabilities Negotiating skills	02	Game based exercises
	Self management Time management	01	Lecture
9	Conflict management Cultural awareness	02	Role play Lecture
10	Common knowledge Responsibility	02	Lecture
11	Etiquette and good manners Courtesy	01	Role play Group discussion

12	Self esteem Sociability	02	Role play Group discussion
13	Integrity/honesty Empathy	01	Role play Group discussion
14	Work ethics ; work attitude and professionalism Business management	02	Case scenario based Group discussion
15	Leadership skills	02	Video Role play followed by discussion
16	Networking skills, public speaking skills	03	Lecture
17	Flexibility and adaptability Organizational skills, emotional intelligence	03	Role play followed by discussion

Assessment plan

Formative : Reflective writing and active participation in the session

Summative examination for 50 marks

- MCQ – 10 Marks
- Reflective writing on a given scenario – 10 marks
- Long essay of Problem solving- One question of 10 marks.
- Short essays – 2 questions of 4 marks each=8 marks
- Short answers – 4 questions of 3 marks each=12 marks

Teaching learning Methodology

Specific learning objectives

At the end of completing this elective the student should be able to

1. Understand and apply adult learning principles in teaching learning methods
2. Enlist and apply the interactive teaching learning methods at classroom and clinical setting
3. Describe and use the techniques of self-directed learning
4. Understand the concept of E learning in health professional education

Hrs: 30

SI No	Title of the topic	No of hours	Method of instruction
1	Introduction to Teaching Learning Methodologies	01	Lecture
2	Androgogy and Pedagogy	02	Small Group Discussions
3	Large Group Teaching; Lectures (Dydactic lectures and interactive lectures)	02	Lecture and demonstrations
4	Flipped Class Rooms	01	Instructional directives and discussion
5	Small Group teaching (Tutorials, seminars)	02	Instructional directives and discussion
6	Brainstorming / Snow Balling/ Role Playing	02	Role play Group discussion
7	Journal Clubs/ Problem based learning (PBL)	01	Group discussion
8	Clinical teaching (Bed side teaching)	01	Role play Group discussion
9	Team-based learning (TBL) and Case – based Learning (CBL)	02	Role play Instructional directives and discussion
10	Independent Learning; Self- Directed Learning (SDL)	02	Instructional directives and discussion
11	Teaching of Procedural skills: Learn, see, practice, prove, do and maintain	02	Video, group discussion

12	Simulators (Mannequins and models)	02	Instructional directives and discussion
13	Simulated patients and virtual patients	01	Instructional directives and discussion
14	e-learning	02	Instructional directives and discussion
15	Innovative Teaching-Learning Methods : Pecha-Kucha Technique, Cine-meducation.	02	Video, role play, discussion
16	Collaborative Learning: Peer assisted Learning System (PALS), Peer to peer learning (P2P)	02	Lecture, video, group discussion
17	Massive Open Online Courses (MOOCs)	03	Lecture and group discussion Instructional directives and discussion

Assessment plan

Formative : Reflective writing and active participation in the sessions

Summative examination for 50 marks

- MCQ – 10 Marks
- Reflective writing on a given scenario – 10 marks
- Long essay of Problem solving- One question of 10 marks.
- Short essays – 2 questions of 4 marks each
- Short answers – 4 questions of 3 marks each

IV-SEMESTER

CORE- M4: BACTERIOLOGY

Specific Learning objective:

- Students will be able to: understand the morphology of various bacteria associated with human infection.
- Students will be able to: understand the pathogenicity of the bacteria associated with human infection.
- Students will be able to: understand the laboratory diagnosis of bacterial infectious diseases.
- Students will be able to: understand the treatment modalities and prevention of bacterial infectious diseases

Theory: 40 hrs

1. STAPHYLOCOCCUS

3hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by staphylococcus.

2. STREPTOCOCCUS & STREPTOCOCCUS PNEUMONIAE

3hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Streptococcus and streptococcus pneumoniae.

3. NEISSERIA

2hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Neisseria meningitidis and Neisseria gonorrhoeae..

4. CORYNEBACTERIUM

2hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, Phage typing, laboratory diagnosis, Prevention and Treatment of diseases caused by Corynebacterium diphtheriae
Other pathogenic Corynebacterium

5. BACILLUS

1hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Bacillus anthracis, Bacillus cereus and Anthracoid bacilli.

6. ANAEROBIC BACTERIA I – CLOSTRIDIUM

4hrs

Classification of Clostridium

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Clostridium perfringens, Clostridium septicum, Clostridium novyi, Clostridium histolyticum, Clostridium tetani and Clostridium botulinum.

7. ANAEROBIC BACTERIA II - NON-SPORING ANAEROBES

1hr

Classification, Clinical manifestations, Laboratory diagnosis and Treatment of Non-sporing anaerobic bacterial infections.

8. ENTEROBACTERIACEAE I - COLIFORM - PROTEUS

2 hrs

Classification of Enterobacteriaceae. Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by E.coli, Klebsiella, Citrobacter, Enterobacter, Edwardsiella, Hafnia, Serratia and Proteus.

9. ENTEROBACTERIACEAE II – SHIGELLA

1 hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Shigella.

10. ENTEROBACTERIACEAE III – SALMONELLA

2 hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Salmonellae.

Multi resistant salmonellae

11. VIBRIONACEAE

3hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Vibrio cholera

Vibrio mimicus, Halophilic vibrios, Aeromonas and Plesiomonas.

12. PSEUDOMONAS & NON FERMENTERS

2hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Pseudomonas and other non-fermenters

13. YERSINIA, PASTEURELLA, FRANCISELLA

2hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Yersinia pestis and Yersinia enterocolitica.

Pasteurella multocida and Francisella tularensis

14. HAEMOPHILUS**2hrs**

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Haemophilus influenza.

Haemophilus ducreyii & HACEK group

15. BORDETELLA**1hr**

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Bordetella pertussis,

Bordetella parapertussis Bordetella bronchiseptica

16. BRUCELLA**2hrs**

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Brucella

17. MYCOBACTERIUM I : M.TUBERCULOSIS**4hrs**

Morphology, cultural characteristics, Resistance, Biochemical reactions, antigenic properties, Typing methods, Host range of Mycobacterium tuberculosis Tuberculosis- Classification, Epidemiology, Laboratory diagnosis, Pulmonary Tuberculosis, Extrapulmonary Tuberculosis, Prophylaxis & Treatment

18. MYCOBACTERIUM II : NON-TUBERCULOSIS MYCOBACTERERIA (NTM) 1hr

Runyoun classification

Skin pathogens- Ecology & Epidemiology

Treatment

19. MYCOBACTERIUM III: M.LEPRAE**2hrs**

Mycobacterium leprae- Morphology, cultivation, Resistance Leprosy- Classification, Epidemiology, Immunity, Laboratory diagnosis, Prophylaxis & Treatment

Recommended Books

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology
4. Bailey & Scott's- Diagnostic Microbiology
5. Introduction to Diagnostic Microbiology

CORE- M5: BACTERIOLOGY & PARASITOLOGY

Specific Learning objectives

- Students will be able to understand: the morphology of various bacteria associated with human infection.
- Students will be able to understand: the pathogenicity of the bacteria associated with human infection.
- Students will be able to understand: the laboratory diagnosis of bacterial infectious diseases.
- Students will be able to understand: the treatment modalities and prevention of bacterial infectious diseases.
- Students will be able to understand: the morphology of various parasites associated with human infection.
- Students will be able to understand: the life cycle of parasites and pathogenicity of parasitic infectious diseases.
- Students will be able to understand: the laboratory diagnosis of parasitic infectious diseases.
- Students will be able to understand: the treatment modalities and prevention of parasitic infectious diseases.

Hrs: 40 hrs

1. SPIROCHETES

4hrs

Classification of Spirochetes

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by *Treponema*, *Borrelia* and *Leptospira* species

2. MYCOPLASMA

1hrs

Morphology, cultural characteristics and identification, epidemiology, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by *Mycoplasma pneumoniae* and *Ureaplasma urealyticum*

3. ACTINOMYCETES

2hrs

Classification of Actinomycetes, Laboratory diagnosis, Epidemiology & Treatment of Actinomycosis Laboratory diagnosis, & Treatment of *Nocardia* infection

4. MISCELLANEOUS BACTERIA

1hr

Morphology, cultural characteristics and identification, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by *Listeria*, *Erysipelothrix*, *Alcaligenes*, *Chromobacterium*, *Flavobacterium*, *Campylobacter*, *Helicobacter* & *Legionella pneumophila*

5. RICKETTSIACEAE

2hrs

Classification and Characteristics of Rickettsiae

Morphology, cultural characteristics, identification, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by Rickettsia, Orientia, Ehrlichia, Coxiella and Bartonella

6. CHLAMYDIAE

1hr

Classification, morphology, Growth cycle, Antigenic properties, Resistance of Chlamydiae Morphology, cultural characteristics, identification, pathogenesis, antigenic characteristics, laboratory diagnosis, Prevention and Treatment of diseases caused by C.trachomatis, C.psittaci and C.pneumoniae.

7. NORMAL MICROBIAL FLORA OF HUMAN BODY

1hr

Normal flora of skin, conjunctiva, Upper respiratory tract, GIT and Genitourinary system.

8. GENERAL INTRODUCTION: PARASITOLOGY & LABORATORY DIAGNOSIS OF PARASITIC DISEASES

2Hrs

Taxonomy of parasites, Host-parasite relationship, Transmission of parasites, Life cycle of the parasites, Pathogenesis of parasitic diseases, Immunology of parasitic diseases, Laboratory diagnosis of parasitic diseases & Treatment of parasitic diseases

9. INTRODUCTION TO PROTOZOA & AMOEBA

2hrs

General features of protozoa, Classification of protozoa, Pathogenic intestinal amoebae, Nonpathogenic intestinal amoebae, Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

10. FLAGELLATES - I (INTESTINAL AND GENITAL): GIARDIA AND TRICHOMONAS

1hr

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

11. FLAGELLATES - II (HEMOFLAGELLATES): LEISHMANIA AND TRYPANOSOMA

2hrs

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

12. APICOMPLEXA - I (MALARIA PARASITE AND BABESIA)

3Hrs

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

13. APICOMPLEXA - II (OPPORTUNISTIC COCCIDIAN PARASITES): TOXOPLASMA, CRYPTOSPORIDIUM, CYCLOSPORA, CYSTOISOSPORA AND SARCOCYSTIS

2Hrs

General features , Classification , Morphological forms, Life cycle, Pathogenesis,

Laboratory diagnosis, Treatment & Prevention

14. MISCELLANEOUS PROTOZOA: MICROSPORIDIA, BALANTIDIUM COLI AND BLASTOCYSTIS **1hr**

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

15. INTRODUCTION TO HELMINTHS & CESTODES: DIPHYLLOBOTHRIUM, TAENIA, ECHINOCOCCUS, HYMENOLEPIS, AND OTHERS **4Hrs**

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

16. TREMATODES OR FLUKES: SCHISTOSOMA, FASCIOLA, CLONORCHIS, OPISTHORCHIS, FASCIOLOPSIS, PARAGONIMUS AND OTHERS **3Hrs**

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

17. NEMATODES - I (INTESTINAL NEMATODES): TRICHURIS, ENTEROBIUS, HOOKWORM, STRONGYLOIDES AND ASCARIS **4Hrs**

General features , Classification , Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention

18. NEMATODES- III (SOMATIC NEMATODES): FILARIAL NEMATODES, DRACUNCULUS TRICHINELLA & MEDICAL ENTOMOLOGY **4Hrs**

General features, Classification, Morphological forms, Life cycle, Pathogenesis, Laboratory diagnosis, Treatment & Prevention.

Recommended books

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology
4. Bailey & Scott's- Diagnostic Microbiology
5. Introduction to Diagnostic Microbiology
6. Textbook of Parasitology- Chattarjee
7. Textbook of Parasitology- Paniker
8. Textbook of Parasitology- Sandhya Bhatt

SEMESTER 4 - PRACTICALS

MODULE- M3: CLINICAL BACTERIOLOGY & SEROLOGY- I

30 Hrs

1. Pure culture processing
2. Mixed culture processing
3. Serological tests for bacterial infectious diseases
 - Widal test
 - Weil felix test
 - Standard agglutination test for Brucella
 - RPR

MODULE- M4: CLINICAL PARASITOLOGY- II

30 Hrs

1. Stool examination, Stool concentration techniques & Modified ZN staining
2. Peripheral smear examination for hemoflagellates and antigen detection for malarial parasites
3. Reagents preparation for stool examination

Practical Examination

MODULE M3 & M4

1. Pure culture processing- 30 Marks
2. Mixed culture processing- 20 Marks
3. Serological tests for bacterial infectious diseases- 20 Marks
4. Stool examination techniques- 20 marks
5. Spotters (Slide examination)- 10 marks

Recommended books

1. Mackie & McCartney Practical Medical Microbiology
2. Bailey & Scott's- Diagnostic Microbiology
3. Introduction to Diagnostic Microbiology

Core M 6- Clinical Laboratory postings

A. Identification of Gram-negative bacteria

- Enterobacteriaceae
- Non Fermenters
- Vibrionaceae

B. Identification of Gram-positive bacteria

- Staphylococci
- Streptococci
- Enterococci

C. Bacterial stock maintenance

- Preparation of stock culture media
- Maintenance of stock culture

D. Stool microscopy & peripheral smear examination

- Preparation of reagents for stool microscopy
- Stool microscopic examination
- Stool concentration techniques
- Acid fast staining for stool
- Peripheral smear- preparation, staining and examination

Recommended books

1. Mackie & McCartney Practical Medical Microbiology
2. Bailey & Scott's- Diagnostic Microbiology
3. Introduction to Diagnostic Microbiology

Allied 4 – Biostatistics

Specific learning objectives: The course will enable the student to understand how to effectively collect data, describe data, and use data to make inferences and conclusions about real world phenomena. After finishing this course, students should be able to:

1. Recognize the importance of data collection and its role in determining scope of inference.
2. Demonstrate a solid understanding of interval estimation and hypothesis testing.
3. Choose and apply appropriate statistical methods for analyzing one or two variables.
4. Use technology to perform descriptive and inferential data analysis for one or two variables.
5. Interpret statistical results correctly, effectively, and in context.
6. Understand and critique data-based claims.
7. Appreciate the power of data.
8. Apply the basic terminology and definitions of epidemiology.

Unit – I 2 Hours

Introduction :Introduction to Biostatistics; levels of measurement – nominal, ordinal, interval and ratio scales; Types of Data- quantitative and qualitative

Unit –II 2 Hours

Descriptive statistics – central tendency, dispersion, skewness and kurtosis.

Unit – II 3 Hours

Sampling : Probability and non-probability; simple random, stratified, systematic, cluster and multistage sampling; sampling and non – sampling errors

Unit III 3 Hours

Sample size estimation : Sample size determination for estimation : sample size determination for estimation of mean, estimation of proportion, comparing two means and comparing two proportions.

Unit – IV 5 Hours

Hypothesis testing : formulation and types; null hypothesis, alternate hypothesis, type I and type II errors, level of significance, power of the test, p –value , concept of standard error and confidence interval . Concept of Probability “probability distribution – normal, poisson, binomial

Unit – V 3 Hours

Epidemiological studies : Rates – Prevalence and incidence; types – Prospective and retrospective studies; Diagnostic Efficiency Statistics (Sensitivity, specificity, predictive values); Risk Estimation – odds ratio and survival analysis.

Unit – V**4 Hours**

Tests of significance – Parametric tests: requirements, “t” test, normal z – test, and “F” test including post – hoc tests, one – way and two-way analysis of variance, analysis of covariance, repeated measures analysis of variance, simple linear correlation and regression.

Unit – VI**3 Hours**

Test of significance – Non – parametric tests: Assumptions; one – sample tests (sign test, McNemar test); two – sample test (Mann whitney U test, Wilcoxon rank sum test); k –sample tests (Kruskal wallies test, and Friedman test) and chi-square test.

Unit – VII**5 Hours**

Multivariate analysis : Introduction, Multiple regression, logistic regression, factor analysis, cluster analysis,

Essential references :

- B.L (2007). Qualitative Research : Methods for the social sciences (6th ed.) New York: Pearson education.
- Daniel, W.W. (2005). Biostatistics: a foundation for analysis in health sciences (8th ed.) New York: John wiley and Sons.
- Dillon, W.R. & Goldstein, M. (1984). Multivariate analysis: Methods & Applications. New York: John Wiley & Sons.
- Hassart, T.H (1991). Understanding Biostatistics. ST. Louis: Mosby year Book.
- Kerlinger, F.N. (1995). Foundations of Behavioral research. New York: Holt Rineheart & Winston.
- Kothari, C.R.(2003) Research Methodology. New Delhi: Wishwa Prakshna.
- Siegal, S. & castellan, N.J (1988). Non – parametric statistics for the behavioral sciences. McGraw Hill: New Delhi

Assessment Plan- Theory 50 marks

- 5 marks x 4 questions= 20 marks
- 2 marks x 15 questions=30 marks

Discipline Specific Electives

Immunofloresence

Specific learning objectives

The student should be able to

1. Understand the importance of Immunofloresnce techniques in diagnosis of infectious diseases.
2. Know the types, principles, procedures and interpretation of Immunofluorescence techniques in diagnosis of infectious diseases.

Outcomes:

1. The student will have the opportunity to understand the importance of Immunofluorescence techniques in diagnosis of infectious diseases.
2. The student will be able to understand the fundamental types principles, procedures and interpretation of Immunofluorescence techniques used in diagnosis.
3. The student will be able to understand the overall procedural steps involved in Immunofloresnce techniques and its interpretation.
4. The student will be able to perform different types of fluorescence techniques. This knowledge will be helpful in further Research aspects of the student.

Theory

30hrs

- Introduction to Immunofluorescence microscopic techniques
- Florescent microscopic techniques.
- Different types, principle, uses and limitations of Immunofluorescence in diagnosis of Infectious diseases.

Recommended books

1. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
2. Bailey & Scott's- Diagnostic Microbiology Ellen Jo Baron et.al.
3. Introduction to Diagnostic Microbiology- Elmer W Koneman el al\
4. Manual of Clinical Laboratory Immunology- Noel R Rose et al
5. Fundamental Immunology- William E Paul

Assessment Plan- Theory 50 marks

5 marks x 4 questions= 20 marks

3 marks x 10 questions=30 marks

Environmental surveillance

Specific learning objectives

Objectives:

The student should be able to:

1. Understand the importance of Environmental surveillance in hospitals and community.
2. Know the procedure of sample collection; cultures processing and interpretation of environmental surveillance.

Outcomes:

1. The student will have the opportunity to understand the importance of surveillance of different environmental samples like Air, water in different areas of the hospital.
2. The student will know the indicator organisms of water contamination.
3. The student will know, the collection, transportation, various methods of water analysis and its interpretation.
4. The student will know, the air sampling methods, analysis and its interpretation.
5. The student will know the indications for surface surveillance of hospital environment.

Theory

30hrs

- Bacteriology of water and different water analysis methods.
- Indications and methods for air quality testing.
- Methods of sample collection from various surface areas of hospital, its processing and interpretation.

Recommended books

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology
4. Bailey & Scott's- Diagnostic Microbiology
5. Introduction to Diagnostic Microbiology

Assessment Plan- Theory 50 marks

5 marks x 4 questions= 20 marks

3 marks x 10 questions=30 marks

V-SEMESTER

CORE- M7: VIROLOGY

Specific Learning objectives:

- The Students should be able to understand the morphology and classification of various viruses associated with human infection.
- The Students should be able to understand the pathogenicity of various viral infections.
- The Students should be able to understand the laboratory diagnosis of viral infectious diseases.
- The Students should be able to understand the treatment modalities and prevention of viral infectious diseases.

Theory

40 hrs

1. GENERAL PROPERTIES OF VIRUSES

2hrs

Morphology, multiplication, classification, nomenclature and cultivation of virus
Viral genetics, non genetic interactions, viral assay

2. VIRUS - HOST INTERACTIONS: VIRAL INFECTIONS

4hrs

Pathogenesis and host response to viral infections, Laboratory diagnosis, Immunoprophylaxis, chemoprophylaxis and chemotherapy of viral infections

3. BACTERIOPHAGES

1hr

Morphology and life cycle of Bacteriophages, transmission of genetic information and significance of phages

4. POXVIRUSES

2hr

Morphology, properties, antigenic properties and cultivation of smallpox and other pox viruses. Prophylaxis of small pox infection.

5. HERPESVIRUSES

5hrs

Morphology, replication, resistance and classification of herpesvirus. Pathogenicity, clinical features, laboratory diagnosis and treatment of herpes simplex viral infections. Pathogenicity, clinical features and laboratory diagnosis of chickenpox, herpes zoster, cytomegalovirus and Epstein barr viral infections. Other human herpes viruses.

6. ADENOVIRUSES

1hr

Pathogenicity, clinical features, laboratory diagnosis, treatment and prophylaxis of adenoviral infections.

7. PICORNAVIRUSES**3hrs**

Classification, Morphology, resistance, Antigenic properties, Host range cultivation, Pathogenicity, Clinical features, Laboratory diagnosis, Immunity, Prophylaxis, Epidemiology of Poliovirus, Coxsackie virus, Echovirus, New Enterovirus types (Acute hemorrhagic conjunctivitis), Rhinoviruses.

8. ORTHOMYXOVIRUSES**2hrs**

Morphology, resistance, Antigenic classification of Influenza virus classification, Antigenic variation, Host range, Pathogenicity, clinical features, laboratory diagnosis, Immunity, Epidemiology, Immunoprophylaxis and Treatment of influenza viruses infection.

9. PARAMYXOVIRUSES**2hrs**

Antigenic structure, classification Rubulavirus- properties, Clinical features, Complications, Epidemiology, Immunity, Laboratory diagnosis & Prophylaxis of Mumps viral infections & Parainfluenza virus infection Pneumovirus- Respiratory syncytial virus - Clinical features, Epidemiology, Immunity, Laboratory diagnosis, Prophylaxis & Treatment Morbillivirus- Measles - Clinical features, Epidemiology, Immunity, Laboratory diagnosis, Prophylaxis & Treatment Nipah, Hendra & Human metapneumo virus.

10. ARBOVIRUSES**5hrs**

Classification, Antigenic structure, Pathogenicity, Laboratory diagnosis, Epidemiology & control of various Arboviruses – Togaviridae, Flaviviridae, Bunyaviridae, Reoviridae, Rhabdoviridae & Rodent borne viruses.

11. RHABDOVIRUSES**3hrs**

Morphology, pathogenicity, laboratory diagnosis, Prophylaxis & Treatment of Rabies Rabies virus.

12. HEPATITIS VIRUSES**4hrs**

Types of viral hepatitis, Antigenic structure, Pathogenicity, Laboratory diagnosis, Epidemiology & control of Hepatitis A,B,C,D,E,G virus.

13. MISCELLANEOUS VIRUSES**2hrs**

Human papilloma virus, Human polyoma virus, Parvo virus, Slow viral disease, Rubella virus, Corona virus, Reoviridae. Viral hemorrhagic fever and Virus causing diarrhea.

14. ONCOGENIC VIRUSES**1hr**

Types of oncogenic virus, Transformation, Oncogenes, Anti oncogenes and Mechanisms of viral oncogenesis

15. HUMAN IMMUNODEFICIENCY VIRUS: AIDS**3hrs**

Structure, Antigens, Antigenic variations, Resistance of HIV virus Pathogenesis,

Clinical features, Laboratory diagnosis, Testing strategies, Epidemiology, Prevention, Prophylaxis and Treatment of Acquired immunodeficiency syndrome

Recommended books

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
4. Bailey & Scott's- Diagnostic Microbiology Ellen Jo Baron et.al.
5. Introduction to Diagnostic Microbiology- Elmer W Koneman et al
6. Laboratory Diagnosis of Viral Infections Edmin H Lennette
7. Clinical Virology – Douglas D.Richman, Newyork,
8. Field's Virology Vol.1 & 2- Bernards N Fields et al Philadelphia

CORE- M8: MYCOLOGY

Learning objectives:

- Students will study the morphology and classification of various fungus
- associated with human infection.
- Students will understand the pathogenicity of various fungal infections.
- Students will understand the laboratory diagnosis of fungal infections diseases.
- Students will understand the treatment modalities and prevention of fungal infections.

Theory

40 hrs

Topics

1. MORPHOLOGY AND CLASSIFICATION OF FUNGI, REPRODUCTION 6Hrs

Morphological classification, Taxonomical classification, classification of fungi diseases, laboratory diagnosis of Fungal infections

2. ANTIMYCOTIC AGENTS 5Hrs

Class, drugs, mechanism of action, uses

3. SUPERFICIAL MYCOTIC AGENTS 7Hrs

Introduction, organisms causing superficial mycosis, Dermatophytes, pathogenesis, clinical types, laboratory diagnosis, Treatment

4. SUBCUTANEOUS MYCOTIC AGENTS 7Hrs

Introduction, causative agents, pathogenesis, clinical manifestation, Epidemiology, laboratory diagnosis, Treatment of subcutaneous mycoses.

5. SYSTEMIC MYCOSES 6Hrs

Organisms causing systemic mycoses, pathogenesis, clinical manifestation,

Epidemiology, laboratory diagnosis and Treatment.

6. CONTAMINANT AND OPP. FUNGI

6Hrs

Causative agents, pathogenesis ,Risk factors , clinical manifestation ,laboratory diagnosis , Treatment of opportunistic fungal infection.

7. MYCOTOXICOSES

3Hrs

Classification, source , clinical condition

Recommended books

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
4. Bailey & Scott's- Diagnostic Microbiology Ellen Jo Baron et.al.
5. Introduction to Diagnostic Microbiology- Elmer W Koneman el al
6. Medically important fungi- Davise.H.Larone
7. Text book of Mycology- Jagadish Chander

SEMESTER 5

PRACTICALS

MODULE- M5: CLINICAL VIROLOGY PRACTICALS

30 Hrs

1. Serological techniques in Virology – ICT
 - HIV Tridot
 - HCV Tridot
 - HBsAg ICT
2. Serological techniques in Virology - CLIA, ELISA
 - HIV, HBsAg and HCV (CLIA & ELISA)
 - Paul Bunnel test for Infectious mononucleosis

MODULE- M6: MYCOLOGY PRACTICALS

30 Hrs

1. Fungal stain preparation
2. Fungal media preparation and QC
3. Identification of Fungi - yeasts, moulds
4. Slide culture techniques

Practical Examination: MODULE M5 & M6

1. Spotters (slides examination)- 10 Marks
2. Viral serological technique- 30 Marks
3. Identification of pathogenic fungi- 30 Marks
4. Identification of contaminant fungi- 30 Marks

Recommended books

1. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
2. Bailey & Scott's- Diagnostic Microbiology Ellen Jo Baron et.al.
3. Introduction to Diagnostic Microbiology- Elmer W Koneman et al
4. Medically important fungi- Davise.H.Larone

CORE M9: Clinical Laboratory postings

A. ICT/ ELISA/ CLIA

- HIV
- HBsAg
- HCV
- Markers of viral Hepatitis

B. Preparation of fungal stains and media:

- Lactophenol cotton blue
- LCB with PVA
- KOH
- SDA/ PDA/ Corn meal agar /Bird seed agar: Preparation and quality control.
- Sugar assimilation & Fermentation media.

C. Identification of pathogenic and contaminant fungi:

- Dermatophytes
- Yeasts
- Contaminant fungi.

Recommended books

1. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
2. Bailey & Scott's- Diagnostic Microbiology Ellen Jo Baron et.al.
3. Introduction to Diagnostic Microbiology- Elmer W Koneman et al
4. Medically important fungi- Davise.H.Larone

Skill enhancement-Internship training

Students will be trained in reputed laboratories/industries for a period of 2 months. Only those students who have passed all the courses in all the semesters can enter the industry internship. The student must maintain the logbook which has to be certified by the concerned authority in the industry on a daily basis. At the end of the internship, the student should have attained the defined competencies and write his reflection which will be certified by the Laboratory/industry authorities along with their feedback. This will be submitted to the head of the department. Based on the logbook, his/her reflection and the feedback from the laboratory/industry marks will be allotted from a maximum mark of 50.

Discipline specific electives
Laboratory accreditation/Cell culture studies
Laboratory accreditation

Specific learning objectives: The student should be able to

1. Understand the importance of accreditation and types of accreditation in a Health care system
2. Understand the benefits of NABH & NABL accreditation

Outcomes

1. The student will have the opportunity to understand the importance of Accreditation in Health care system: Hospital as well as Medical Laboratories
2. The student will be able to understand the overall processes involved in the NABH accreditation: various standards, objective elements.
3. The student will be able to understand the overall processes involved in the NABL accreditation: Technical requirements, Management requirements and related clauses.
4. The student will be able to understand the need of accreditation and the benefits of accreditation
5. The student gains the competency to participate and play an active leadership role in health care set-ups, who are in the process of applying for accreditation

Theory

Accreditation of Health Care Systems:

Ensuring quality is a critical component of high-performing health care systems. Patients who enter the health care system—whether a clinic, a hospital, or laboratory— need to be confident that they will receive care that is safe, effective and consistent with the latest clinical evidence.

Accreditation can be the single most important approach for improving the quality of health care structures. In an accreditation system, institutional resources are evaluated periodically to ensure quality of services on the basis of defined standards. Accreditation is rather, a means to improve quality.

The Hospital Accreditation” approach is a concept and practice that yields beneficial results to patients, customers, hospital personnel, the hospital, the Faculty of Medicine, the society and the country as a whole.

National Accreditation Board for Hospitals & Healthcare Providers (NABH)

is a constituent board of Quality Council of India, set up to establish and operate accreditation programme for healthcare organisations.

National Accreditation Board for Testing and Calibrating Laboratories (NABL) is a Constituent Board of Quality Council of India. NABL has been established with the objective of providing Government, Industry Associations and Industry

in general with a scheme of Conformity Assessment Body's accreditation which involves third-party assessment of the technical competence of testing including medical and calibration laboratories, proficiency testing providers and reference material producers.

Benefits of Accreditation:

- Enhanced health care network.
- Continuous quality improvement:
- High quality of care & patient safety
- Improved decision-making
- Provides opportunity to the healthcare unit to benchmark with the best
- Improved accountability and regulation

Overall, Accreditation provides access to reliable and certified information on facilities, infrastructure and level of care. Exam pattern:

Theory:

Preparation of a QSP – 10 marks Preparation of a SOP – 10 marks

Short Essays – 3 questions – 5 marks each – 15 marks Short Answer – 5 questions – 3 marks each – 15 marks

Molecular methods Specific learning objectives

The student should be able to

1. Understand the importance of molecular methods in diagnosis of infectious diseases.
2. Understand the benefits of different types of molecular methods.

Outcomes:

1. The student will have the opportunity to understand the importance of molecular methods in diagnosis of infectious diseases.
2. The student will be able to understand the different types of molecular methods used in diagnosis.
3. The student will be able to understand the overall processes involved in PCR techniques and its interpretation.
4. The student will be able to understand the need of accreditation and also the benefits of accreditation
5. The student will be able to perform both conventional and Real-time PCR. This knowledge will be helpful in further Research aspects of the student.

Theory

30Hrs

- Introduction to Molecular techniques
- Different types, principle and uses of PCR in diagnosis of Infectious diseases.
- Primer/Probe used for detection for drug resistance/ virulence of various microbes.
- Different methods for extraction of genomic DNA/ RNA from clinical samples
- and isolates.
- Nucleic acid quantification techniques.
- Gel electrophoresis and documentation.
- Interpretation of results.

Reference books

1. Text of Microbiology- Ananthanarayan & Paniker
2. Text of Microbiology- Apurba Shankar Sastry
3. Mackie & McCartney Practical Medical Microbiology- J.G.College et al
4. Bailey & Scott's- Diagnostic Microbiology Ellen Jo Baron et.al.
5. Introduction to Diagnostic Microbiology- Elmer W Koneman et al

Exam pattern

Assessment Plan- Theory 50 marks

5 marks x 4 questions= 20 marks

3 marks x 10 questions=30 marks