

M.Sc. (Medical Microbiology) course

Syllabus of First year subjects

1st year

BASICS OF ANATOMY (Paper 1)

General Anatomy

1. Anatomical terminology, Anatomical plane, Anatomical positions, Clinical positions, Terms related to movements
2. Basics of cytology: Structure of cell wall, Cell organelles,
3. Musculoskeletal system:
 - (a) Bones & classification, Morphology, ossification functions, blood supply
 - (b) Muscles, Morphology, classification blood supply, innervations, functions
4. Integumentary system: Thick Skin, Thin skin layers of dermis epidermis, Skin appendages, blood supply, innervations, functions
5. Cardiovascular system: Morphology of blood vessel, classification of blood vessels, blood capillaries, blood circulation, functions
6. Nervous system: Central Nervous system & Peripheral Nervous system, Gross basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, Autonomic nervous system
7. Endocrine system: Classification, Hormone produces, Control of hormone secretion, basic functions
8. Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions
9. Digestive system: Parts of digestive system, gross anatomy and functions
10. Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder penis and their functions
11. Reproductive system: Male reproduction system- gross anatomy of testis, epididymis, vas-deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle
12. Basics of genetics: Cell division ,mitosis, meiosis, Cell cycle, Chromosomes

Gross Anatomy (Elementary Anatomy)

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck & Fact Region

Anatomy of each part including functional, sectional and radiological anatomy

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Recommended Books

1. Williams et al, *Gray's Anatomy*, Livingstone Churchill.
2. B. Young and J. Heath, *Wheaters' Functional Histology*, Livingstone Churchill
3. Ross M.H., *Histology: A Text & Atlas*, Williams & Wilkins.
4. Langman Jan, *Medical Embryology*, William and Wilkins.
5. Thompson J.S. & Thompson M.W., *Genetic in Medicine*, W.B. Saunders & Co. Philadelphia,
6. Stuin J & Carpenter MB, *Human Neuroanatomy*,
7. Richard S. Snell, *Clinical Neuroanatomy for Medical Students*, Willian and Wilkins

M.Sc. (Medical Microbiology) course
1st year
BASICS OF PHYSIOLOGY (paper 2)

1. Cell Physiology

Cell Structure and membrane transport, Resting Membrane Potential, Composition of ECF and ICF, Nernst Equation, Equilibrium Potential, Goldmann Equation

2. Nerve-Muscle and Biopotential

Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of contraction and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation)

3. Blood

Function and Composition, Erythrocytes, Haemoglobin, Blood groups, Leucocytes, Thrombocytes, Immunity

4. Cardiovascular System

Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation

5. Respiration

Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants

Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity

6. Gastrointestinal Tract

Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function of bile), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT

7. Excretory System

Function of kidney, Structure of nephron, Juxta glomerular apparatus, Formation of urine

Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid base balance, Renal function tests, Micturition

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8. Autonomic Nervous System

Organization of the ANS, Chemo-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems

9. Central Nervous System

General organization of CNS & PNS, Sensory system :(General sensations, receptors, sensory pathways, sensory areas of brain)

Motor system: (muscle spindle, Golgi tendon organ, reflex arc, corticospinal and extra-pyramidal tracts)

Brain: Functions of: Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep

10. Special Senses

Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway)

11. Endocrine System

Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas

12. Reproductive System

General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning

Reference Books (Latest Edition)

1. Guyton, A., *Text Book of Medical Physiology*, Elsevier Publication,
2. Ganong, W.F., *Reviews of Medical Physiology*, Lange Publication
3. Khurana, I., *Text Book of Physiology*, Elsevier Publication
4. Berne V, *Principles of Physiology*, Elsevier Mosby Publication.
5. Lippincott W &Wilkins, *Medical Physiology (Clinical Medicine)*, Rhodes &Bell.

M.Sc. (Medical Microbiology) course
1st year
BASICS OF BIOCHEMISTRY (paper 3)

Basic concepts of Biochemistry to be studied under the following headings:

1. Cell structure and function and transport through the biological membrane.
2. Chemistry of Bio molecules – carbohydrate, lipids, amino acids, proteins and nucleic acids.
3. Chemistry of Blood & haemoglobin.
4. Enzymes.
5. Bioenergetics and Biologic oxidation.
6. Metabolism of carbohydrates, Proteins, lipids and nucleotides.
7. Integration of metabolism.
8. Nutrition, Vitamins & minerals.
9. Molecular Biology.
10. Detoxification & Xenobiotics.
11. Oxygen derived free radicals.
12. Immunology.
13. Organ function tests.

Reference Books

1. Lubert Stryer (Ed.), *Biochemistry*, W.H. Freeman & Company, New York.
2. Lehninger, Nelson & Cox (Ed.), *Principles of Biochemistry*, CBS Publishers & Distributers.
3. Murray R.K. & P.A. Mayes (Ed.), *Harpers Biochemistry*, D.K. Granner,
4. Thomas M.Devlin (Ed.), *Textbook of Biochemistry with Clinical Correlations*, Wiley Liss Publishers.
5. Benjamin Lewin (Ed), *Genes VI*, Oxford University Press

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M.Sc. (Medical Microbiology) course
1st year
RESEARCH METHODOLOGY+ ENVIRONMENTAL
STUDIES (Paper 4)

RESEARCH METHODOLOGY

Unit – 1

Methods of collection of data, classifications and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Significance of statistical methods, probability, degree of freedom, measures of variation - Standard deviation, Standard error.

Unit – 2

Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: t-test, Chi-square test, confidence level, Null hypothesis.

Unit – 3

Analysis of Variance (one way and two way ANOVA). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion and Multiple comparison procedures.

Unit – 4

Non-parametric tests, Experimental design in clinical trials, Statistical quality control, Validation, Optimization techniques and Screening design. Linear regression and Correlation, least square method, significance of coefficient of correlation, nonlinear regression.

Unit – 5

Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report: Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons. Use of SPSS in Data Analysis.

Recommended Books

1. Cooper & Schindler, *Business Research Methods*, Tata McGraw Hill.
2. Saunders *Research Methods for Business Students*, Pearson Education, 2007.
3. Malhotra Naresh K., *Marketing Research*, Pearson Education.
4. Fisher, R.A., *Statistical Methods for Research Works*, Oliver & Boyd, Edinburgh.
5. Chow, *Statistical Design and Analysis of Stability Studies*, Marcel Dekker, New York.
6. Finney, D.J., *Statistical Methods in Biological Assays*, Hafner, New York.
7. Montgomery, D.C., *Introduction to Statistical Quality Control*, Willy.
8. Lipschutz, *Introduction to Probability and Statistics*, McGraw-Hill.

ENVIRONMENTAL STUDIES

Unit – 1

Multidisciplinary of EVS- Introduction, Definition, Scope, Importance, Need for public Awareness, Hospital Set Up, Interrelation between environment and Hereditary, Fossil fuels and detrimental effects, Relation between Environment and public health, Environment Protection Act, Scope of Environmental Studies, Relation between environment pollution and community health.

Unit – 2

Natural Resources- Renewable and Non Renewable resources, Natural resources and associated problems, forest resources, water resources, mineral resources, food resources, energy resources, land resources, role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyle.

Unit – 3

Ecosystem- Introduction ,Defination , Types, Ecosystem relation with humans, wildlife protection act, forest conservation act, ELL NINO consequences.

Unit – 4

Biodiversity- Introduction,Definition , Types, Human impact on biodiversity, Biome, Food chain, Consequences, Conservation


Unit – 5

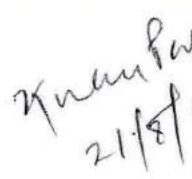
Environment Pollution and Bio Medical Waste management 2016- Pollution definition and its types of Air, water , soil, marine, noise, odour, thermal, nuclear hazards, pollution of solid waste management, its causes and effects, measures of urban and industrial waste role of an individual, prevention of pollution, water prevention , control of pollution act, Disaster Management of flood, earthquake, cyclone, landslides, Biomedical waste management 2016 guidelines water quality , BOD, waste Disposal, Biomedical waste categories.

Unit -6

Social issues and Environment- Urban problems related to energy, water conservation, rain water harvesting, water shade management, resettlement and rehabilitation of people and its problem, concern of environment and ethics, climate change, global warming, acid rain and its effects, ozone layer depletion, nuclear accidents, waste land reclamation consumer reasons and waste product, environment waste act, of Air, prevention and control of pollution act of water, air , wildlife protection act, forest conservation act, issues involved in enforcement of environmental legislation, public awareness, Silent valley movement, chipko movement, Recent changes in Air, climate change, Chernobyl, Green house effect, ozone depletion, Minamata, Narmada bachaoandolan, Environment policy of govt of waste Bengal, Human population.

Reference Books:

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1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)

Syllabus for MSc Medical Microbiology course (2nd and 3rd year)

GENERAL BACTERIOLOGY

Objectives:

To give a comprehensive overview and understanding of the biological principles in relation to microbial structure, physiology, biochemistry and genetics: growth and control of microorganisms

Cognitive skills

1. Cell structure-- Detail of bacterial cell morphology.
2. Microscopy-- Various methods available for viewing microorganisms and their applications.
3. Taxonomy-- Classification of bacteria, classification systems
4. Growth, survival and death of micro-organisms-- Survival of Microorganisms in the natural environment; the meaning of growth; exponential growth; the growth curve. Maintenance of cells in the exponential phase: definition and measurement of death.
5. Cultivation of microorganisms
Growth requirements, sources of metabolic energy, nutrition, environmental and other factors affecting growth, methods of cultivation.
6. Microbial metabolism-- role of metabolism in biosynthesis of & growth, focal metabolites & their interconversion, assimilation pathways, biosynthesis pathways, patterns of Microbial energy-yielding metabolism, regulation of metabolic pathways
7. Control of microorganisms-- Sterilization and disinfection, antimicrobial agents, commonly used lab disinfectants.
8. Antimicrobial susceptibility and antibiotic assays.
9. Bacterial Genetics-- organization of genes, replication, transfer of DNA, mutation & gene rearrangement

IMMUNOLOGY

At the end of the course the student should have an understanding of host defences as well as of basic immunology as primarily a cellular phenomenon with secondary generation of cell products that sub serve immune cell functions, regulation of disorders and infections. The student should also be familiar with immunization and the national immunization schedule. The student should also have an understanding of the immunologic laboratory tests that aid in the diagnosis of clinical disease.

~~The topics covered will be~~ Cognitive skill

Structure and development of the Immune systems

Innate immunity

Cells of the immune system

HLA complex

Antigens and immunogenicity

Antibodies, structure, function and genetics

Antigen-antibody reactions

Cell mediated immunity, T-cell receptors and cytokines

The immune response, T and B cell interactions

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Hypersensitivity reactions

Autoimmune diseases (Auto Immunity, Immuno deficiency)

Psychomotor skills: The student should be able to carry out independently the following procedures (Must know skills)

1. Serum separation
2. Assays: Agglutination, precipitation, ELISA, Immunochromatography etc.
3. Interpretation of test results of these assay.

SYSTEMIC BACTERIOLOGY

Cognitive skills

At the end of this session the students will learn ---

The morphology, cultural, biochemical and other biological properties and characteristics of medically important bacteria.

The mechanism of virulence and pathogenesis and pathology.

The disease caused by them, epidemiology, treatment, prevention and control.

Psychomotor skills: (related to bacteriology)

1. Proper receiving of different specimen – as pre analytic procedures
Collection of specimens for microbiological investigations on Blood, Urine, Throat Swab, Rectal swab, Stool, Pus (swabs), body fluids, OT specimens etc.
2. Microscopy - handling and general maintenance
3. Staining procedures - preparation of stains and staining methodology (Routine and special stains)
4. Growth and survival: of microorganisms
Isolation of bacteria in pure culture, quantitation of microorganism and antibiotic susceptibility.
5. Media preparation
Sterilization and disinfection (Hot air oven, autoclave-operation procedures sterility check, washing and sterilization of glassware, plugging and packing.)
6. Disposal of contaminated materials .
7. Aseptic practices in laboratory and safety precautions.
8. Methods of stains viz. Gram, Alberts, Ziehl-Neelsen and perform staining procedures
9. Anaerobic culture methods
10. Identification of Bacteria of medical importance upto species level (except anaerobes which could be upto generic level).

MYCOLOGY

Course Objective:

The students should have basic knowledge of general properties and taxonomy of fungi, general morphological features and classification of fungi and fungal diseases.

They should be sufficiently informed about medically important fungi, the diseases caused and their laboratory diagnosis. They should develop sufficient psychomotor and skills to be

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able to carry out microscopy, isolation and identification of common medically important fungi.

Cognitive skills:

1. Classification of fungi
2. Growth and isolation
3. Mycoses (all types)
4. Laboratory diagnosis of mycotic diseases
5. Immunity in fungal diseases and value of immuno diagnosis
6. Role of mycotoxin
7. Antifungal agents and antifungal susceptibility
8. Epidemiology of fungal diseases

Psychomotor skills:

Basic identification techniques:

1. KOH & LPCB preparation
2. Staining, techniques
3. Culture of Fungi
4. Slide culture

VIROLOGY

Course Objectives:

At the end of the course the student should have a basic understanding of laboratory diagnosis of viral diseases. The training should help the student to understand basic virus isolation, identification, techniques.

Cognitive skills:

1. General properties of all RNA and DNA virus families of medical importance and prions
2. Pathogenesis, pathology, epidemiology, treatment prevention and control of viral diseases.
3. Basic understanding of viral diagnostics including the relevant theory.

Psychomotor skills:

1. Proper receiving or collection of different specimen for virological investigations – as per analytic procedures
2. preparation of samples for transport with proper labelling and maintaining biosafety measures
3. Different serological tests to identify causative viruses.

Including ELISA for HIV antibody, HBs Ag, Dengue antigen and MAC ELISA and HCV antibody etc

4. Egg inoculation as one of the procedures of virus isolation.
5. Knowledge of Molecular methods applicable for viral diagnostic
5. Disposal of contaminated materials .
6. Aseptic practices in laboratory and safety precautions.

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PARASITOLOGY

Cognitive domain

1. General principles of host-parasite interactions, types of infection, immune response and effect of parasites on the host

Definitions of terms including parasitism, commensalism etc.

2. Morphology, life cycle and pathogenesis of the human parasites listed below. The Students should know the medical importance and laboratory diagnostic methods employed.

Protozoa

1. Intestinal protozoa – amoebae

2. Free living amoebae

3. Flagellates – tissue flagellates

haemoflagellates focusing *Leishmania donovani*.

4. Malaria parasites.

5. Ciliates, coccidia and microsporidia.

Helminths

1. Nematodes

2. Cestodes

3. Trematodes

Psychomotor skills

1. Examination of stool for parasites including concentration techniques, saline, iodine preparation and modified acid fast stain for *Cryptosporidium* and *Isospora*

2. Examination of blood films including Leishmans stain for malarial parasites and microfilaria

APPLIED MICROBIOLOGY

Cognitive skills –

- Normal flora of the human body
- Antibiotic susceptibility testing and its interpretation and reporting
- Hospital infection control: policy and practice
- Quality control in diagnostic microbiology
- National programmes for control of infectious diseases
- Laboratory diagnosis of infectious diseases of each system.
- Research methodology
- Biostatistics

Psychomotor skills:

1. Surveillance sampling

2. Sterility testing

3. Molecular Techniques

4. Bacteriology of water, Air, Milk, Food

5. Preservation and Maintenance of stock cultures

RECOMMENDED BOOKS:

Always the latest edition to be used unless otherwise specified.

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Basic reading:

1. Mackie & McCartney Practical Medical Microbiology 14th edition: Eds: J.G.Colle, A.G. Fraser, B.P. Marmion, A.Simmons- Reprint 2008 Elsevier, New Delhi
2. Jawetz, Melnick & Adelberg's, Medical Microbiology 24th edition: Eds: Brooks and others, McGraw Hill, New York.
3. Koneman's Color Atlas and Text book of Diagnostic Microbiology 7 th edn: Eds: Washington winn and others. 2014 Lippincott Williams and Wilkins, Baltimore, USA
4. Ananthanarayan and Paniker's Text book of Microbiology 8th edn. 2009 Universities Press, Hyderabad.
5. Sastri K Apurba, Bhat K Sandhya. Essentials of Medical Microbiology . 2nd Eds, 2018. Jaypee Brothers Medical Publishers (P) Ltd. New Delhi
6. Sastri K Apurba, Bhat K Sandhya. Essentials of Medical Parasitology . 2nd Eds, 2018. Jaypee Brothers Medical Publishers (P) Ltd. New Delhi

Reference books

1. Medical Mycology. Kwon-Chung K.J and Bennett JE. 1992. Lea and Febiger, Philadelphia, USA.
2. Bailey and Scott's Diagnostic Microbiology- 11th edition: Eds: Forbes BA, Sahn DF, Weissfeld AS. 2002, Mosby, St. Louis, USA.
3. Medical Microbiology, 3rd edition. Eds: MIMS and others. 2004 Mosby, Spain.
4. Topley & Wilson's Microbiology and Microbial infections. 10th edition. Volumes 1-6: 2008old, London.
5. Medical Immunology, 8 th edition Eds: Stites DP, Terr AI and Parslow TG.1997, Appleton & Lange, Stamford, USA.
6. Kuby Immunology . 8th Edition. Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen. 2018 .WH Freeman

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