

B.Sc(MLT) Syllabus 2010

The Tamilnadu Dr.M.G.R Medical University

FIRST YEAR

Sociology & Psychology

time allotted 40 hours

Internal assessment at the end of the year. (50)

Interdependence between man and society.

Socialization during hospitalization.

Professional Socialization.

Social processes , associative and disassociate.

Social groups characteristics functions in a health setting.

Family organisation.

Culture - health & illness.

System of social stratification.

Social control.

Social change.

Social disorganisation

Social planning and social reconstruction

Psychology

time allotted 40 hours

Internal assessment at the end of the year. (50)

1. Introduction , definition , Branches
2. Methodology involved
3. Psychology in health care
4. Sensation , attention and perception
5. Personality
6. Motivation
7. Learning
8. Mental health
9. Creative thinking

ENGLISH

Communication skills in English

time allotted 40 hours

Internal assessment at the end of the year. (50)

The course comprises the study and development of english language

Listening , speaking , reading, writing which will help students communicate well in academic and professional settings.

Course outline:

Unit I: introduction

- Verbal and nonverbal communication
- Facilitators and barriers to communication
- Different registers in english – medical/legal
- Stylistic variations- formal /informal
- Difference between english and indian languages
- Standard english

Unit II: oral communication :

- english pronunciation- homophones/homographs stresses rhythm
- Common error's in pronunciation
- The listening skills.
- Note taking in lecture classes.
- Fluency in speaking
- socio-cultural linguistic competence.

Course description: PHYSIOLOGY.

At the end of the course of study the student should understand the basic structure and functioning of the human body, as a back ground to laboratory work.

1.Cell structure and function or various organelles

Cell divition

2.types of tissue and their functions.

a.epithelia –squamous

-glandular

- transitional

b.connective tissues , joints & skeleton - cartilage

-bone

-fibrous tissue

-muscle

Digestive system:

a. Name the parts – mouth, salivary glands, oesophagus, stomach, small intestine & large intestine

b. Physiology of digestion -in the mouth
 -In the stomach
 - in the intestine

c. Absorption of foods

d. Excretion

4. Liver and biliary tree

a. Brief review of structure of liver and biliary tree.

b. List the liver functions

c. Describe the production and storage of bile

d. Role of bile in digestion

e. excretion of bile

3. Respiratory System:

a. Name of parts – nose , larynx, trachea ,bronchi, lungs

b. basic knowledge of physiology of respiration

4. Cardiovascular system:

Name the parts – heart, aorta, major arteries and veins

Name the chambers of the heart and valves.

Brief review of systematic and pulmonary circulation.

5. Urinary system:

name the parts – kidneys, ureters,bladder, and urethra.

b. structure and functions of nephron

c. list the functions of kidney with special emphasis of formation urine.

6. Male genital system :

Name the parts – testes , epididymis, prostate, seminal vesicle , vas , penis.

b. formation of semen

c. spermatogenesis and structure of sperm.

7. Female genital system:

- a. Name the parts- uterus , cervix, tubes, ovaries, and external genitalia
- b. Brief account of menstrual cycle and normal pregnancy.

8. haemopoietic system:

State the location and structure of spleen , bone marrow and lymph nodes.

- b. haemopoiesis

9. Central nervous system:

- a. name the parts: of brain, spinal cord and meninges.
- b. structure of ventricular system the brain and formation of CSF.

10. Endocrine :

Mention the location and functions of pituitary, thyroid, parathyroid, thymus and adrenals and pancreas.

11. Skin:

- a. brief outline of structure and function of skin.

12. Basic genetics:

- a. list the number of chromosomes
 - b. classify into autosomes and sex chromosomes
 - c. define gene, allele, locus
 - d. Mendel's theory of inheritance
 - e. inheritance of blood groups.
13. outline of HLA system and its applications

Basic Chemistry and Biochemistry

First year: Basic Chemistry and Biochemistry

Course description : at the end of the course the student will have to become familiar with chemistry of carbohydrates , proteins , lipids, lipoproteins, enzymes, nutritional requirements, vitamins, trace elements, and some basic analytical techniques.

Theory:

1. Introduction to Biochemistry

Biophysical aspects of biochemistry; The following topics only.

The theory of acids and bases, ionization of acids , the dissociation of water, hydrogenation concentration and pH, dissociation of acids buffer solutions, determination of pH, titration using indicators.

Carbohydrates:

Chemistry of carbohydrates, classification, physical and chemical properties and the biological importance of carbohydrates.

Proteins:

Biologic importance of proteins , hydrolytic products of protein , classification of amino acids, classification of proteins and lipoproteins

Lipids :

Definition of oils and fats , fatty acids, classification of lipid , properties and biological functions; biological importance of phospholipids and steroids.

Nucleoproteins:

Nucleic acids, nucleotides, nucleosides and structure of nucleic acids, biologically important nucleotides.

Enzymes:

Definition and nature of enzymes, classification, sites, factors affecting enzyme reactions, coenzymes.

Energy metabolism and nutrition:

Calorific value, respiratory quotient, BMR, specific dynamic action, energy requirements, dietary carbohydrates, fiber, nutritional importance of lipids, essential fatty acids, cholesterol, proteins and essential amino acids, nitrogen balance , biological value of protein, protein energy malnutrition.

Chemistry and biological role of vitamins and trace elements.

Basic techniques

Theory of calorimetry , osmometry, electrophoresis and partition chromatography.

Simple acid base filtration.

Simple color reaction of carbohydrates and proteins.

Serum proteins, total protein by biurette method, albumin by BCG method.

Cholesterol estimation and cholesterol oxidase method

Bicarbonate estimation titration method

Simple qualitative chemical tests for carbonate, calcium magnesium phosphate and cystein.

General Methodology

Aims:

Should have a general understanding of the organisation routine functioning and operational standards of laboratories.

Should be aware of the role of the laboratory in patient care , and realize the importance of team building, together with technology evolution.

Should be familiar with specimen collection procedures and aware of pre analytical, analytical, analytical, and post analytical stages of processing of specimens and errors which can occur at each of these stages.

Should be familiar with principles of equipment maintenance, principles of laboratory safety and medico legal concerns.

Should have an idea of the principles of asepsis and sterilization.

Should be introduced to the concept of quality assurance

1. Knowledge of lab organization , reporting and recording procedures.
2. Ethics of laboratory practice, confidentiality of reports. Medico legal aspects of record keeping
3. Method of collection transport , packing and storing of specimens, the concept of pre analytical, analytical and post analytical.
4. Importance of labeling and identification.
5. Preparations of solutions
6. Laboratory glassware and its uses.
7. Concept of universal precautions, biohazard.
8. Handling of waste , waste segregation and management including disposal
9. Laboratory accidents, prevention , first aid.
10. Stores supplies, indenting shelf life , grades of chemicals.
11. Basic mathematics and biostatistics, mean , median, SD, CV.
12. Structure of bacteria ,growth, nutrition, microbes in our environment and normal flora including concepts of pathogenicity.
13. Aseptic techniques, sterilization, and disinfection.
14. Composition of blood normal values, and normal morphology.
15. Different types of blood samples.
16. Anticoagulants, mechanism of action and uses.
17. Routine stores used in the laboratory.
18. Principles and methods of ensuring of quality assistance in the laboratory.

Practicals:

1. Venipuncture and collection of blood samples
2. Preparation of blood films
3. Staining of blood smears
4. Manual count of blood cells
5. Weighing of chemicals and preparation of solution
6. Preparation of cleaning solution for glassware, cleaning glassware drying and sterilization.
7. Pipettes types, clearing, sterilization, uses, calibration, pasts, pipettes.
8. Identification of bacteria, bacterial growth.

PHYSICS

Course description: at the end of the course the student should have a basic understanding of physics as applicable to his future work in the laboratory. He will also be familiar with the functions and maintenance of commonly used laboratory equipment and instruments.

I.Review of physics

Balance physical & chemical balance. Sensitivity of balance use and care of the balance, mass –volume- specific gravity- units and measurements- properties of matter – viscosity of both fluids- diffusion and osmosis –dynamics- motion – types centripetal force and centrifugal force. application centrifuge principle and parts applications in medicine preventive maintenance ph meter parts and principle cell counter – basic principle.

II.HEAT:

Basic concept of quantity of heat . Definition and measurement of above concept of temperature thermometry, thermostat, thermocouple relevant to clinical laboratory, thermal capacity specific heat capacity,calorimetric techniques calorific values of food and fuel kinetic theory of gases- assumptions. Applications laws of thermodynamics water bath- parts, care and usage. Incubator- parts, preventive maintenance and use of refrigerators techniques. Types of refrigerators- cooling ;cycle production of low temperature vapour absorption change of stage, latent heat; cooling by evaporation.

III.Light and optics:

While light color spectrum wavelength frequency dispersion reflection refraction critical angle – total internal reflection. Lasers –types- focal length-magnification power- spherical and chromatic aberrations – filters- spectrometer- principle and parts- applications microscopes.

Types of microscopes- simple – compound – phase contrast-polarizing – fluorescent- dark field-electron microscope-parts and care of the microscope.

IV.sound:

Production and propagation – velocity wave length frequency- ultrasound- properties & problems and application in clinical field.

V. Review of electricity and electronics:

Electricity:

Determination of power ,energy, AC & DC current- resistance – volts,- ohm’s law- cycles – earthing- fuse- transformers types- tum ratio- transformers and stabilizers- uninterrupted power supply(UPS)- electrolysis- basic concept. electrolytes application in medicine , distillation apparatus parts and principle. Medical electronics semi conductors- principles of diodes- rectifiers- oscillators- photoelectric emission integrated circuits.

VI.Radioactivity:

Basis of radioactivity decay constant decay series – artificial radioactivity – radioisotopes-isotopes used in medicine – blood indicator (Gamma chamber)-detectors- non chamber- GM count scintillation

chamber – liquid scintillation counter- electromagnetic radiations – spectrum – ionizing radiation – types charged. Particle radiation – electron beam- its properties – radiation protection- and basic principles of radiation protection- personnel monitoring devices (TLD,Film badge).

SECOND YEAR

Histopathology and cytology techniques

Course description: at the end of the course the student will be able to fix, process, embed tissues and make sections for microsection studies. He will also be competent to make routine cytological preparation.

Theory

Introduction to histopathological techniques

Reception of specimens.

Fixation-formalin fixation.

Tissue processing and embedding.

Section cutting.

Mounting and staining.

Theory of H&E staining.

Theory of EM fixing,processing&cutting.

PAS staining, principle&uses.

Reticulin

PTAM

Van gerson

Amyloid stain , pearl stain

Melanin bleach& masson's Fontana

Theory of immune histo chemistry

Theory of molecular techniques

PAP staining, principles&uses

Cytology

Theory

Principles of exfoliative cytology

Fixation of smears

Pap staining & identification of cells in a normal vaginal smear.

Preparation of smear for fine needle aspiration cytology

Practicals

Embedding & preparation of blocks

Section cutting& use & care of macro dome

H&E staining

PAS staining, principle&uses.

Reticulin

PTAM

Van gerson

Amyloid stain , pearl stain

Melanin bleach& masson's Fontana

AFB staining(TB and Leprosy)

Frozen section & care of cryostat

Pap staining

MGG staining for enac

Museum techniques

Preparation of mounting medium & mounting of specimen-

Biochemistry

Course description

To familiarize the student with the metabolism of carbohydrates, proteins, lipids & the relevant diagnostic tests. Introduction to hormones, purines, pyrimidines & mineral metabolism. Electrophoresis in clinical biochemistry, haemoglobin & porphyrias.

Theory

1. Carbohydrates, digestion & absorption, metabolism of glucose, glycolysis, glycogen formation & breakdown, glycogen storage disease, maintenance of blood sugar levels, hormonal influence, diabetes mellitus, interconversion of monosaccharides.
2. Digestion of proteins, urea synthesis, creatine synthesis & degradation, Transamination, metabolism of amino acids
3. Lipids-digestion & absorption of lipids, synthesis of fatty acids, oxidation of fatty acids, cholesterol synthesis, introduction to eicosanoids, prostaglandins-
4. Purines and pyrimidine metabolism.
5. Hormones:
Role of biologically important hormones. Pituitary hormones, thyroid, adrenal cortex and medulla and sex hormones. Mechanism of control diseases and biochemical tests for under and over production.
6. Mineral metabolism : regulation of blood level; consequences of excess and deficiency of calcium, phosphate, and iron.
7. Haemoglobin and porphyrias :

8. Structure of haem, biosynthesis , porphyrias , catabolism of haem, hemoglobin quaternary structure, structure of myoglobin ,transport of gases,oxygen dissociation of curves, isohydric transport of CO2 fetal Hb, carboxy haemoglobin, methaemoglobin.
9. Electrophoresis of serum, urine and CSF
10. Usefulness in diagnosis, different patterns observed and function of acute phase reactants.
11. Formation and composition of cerebrospinal fluid in disease.

Practicals.

Estimation of serum urea, Creatinine , uric acid calcium and phosphorus.

Demonstration of sodium and potassium estimation by flame photometer and ion selective electrodes .

Demonstration of serum electrophoresis.

Review of estimation of glucose , total protein , albumin and cholesterol. Qualitative urine analysis ,protein , glucose , 5-hydroxy indole acetic acid(%HIAA), total porphyrins.

Coproporphyrin, urobilinogen, bilirubin.

Clinical pathology & basic haematology

Aims:

Should have a clear understanding of haemoglobins. Should know basic disorders related to quantitative and qualitative abnormalities of red cells, WBC and platelets.

Should know laboratory techniques used in diagnosis of the above and disorders.

Should have an introduction to automated technique in haematology.

Should be introduced to basic molecular diagnostics.

Should be aware of the importance of the examination of urine, stool, and other body fluids and be able to examine these specimens and report on basic abnormalities.

1.overview of haematopoiesis.

2.regulation of erythrocyte production , distribution ,morphology, kinetics of haemoglobin synthesis structure function, normal and abnormal.

3.anemias- classification and approach to diagnosis and diagnostic tests.

4.polycythemias

5. wbc production , distribution, morphology, kinetics.
6. Neoplastic and non neoplastic disorders of WBC. Classification and lab diagnosis of leukemias, chronic myeloproliferative disorders and other malignant disorders of the haemopoietic system.
7. platelet- production ,distribution, morphology, kinetics.
8. Quantitative and qualitative abnormalities and inherited and acquired disorders of platelets.
9. introduction to automation in haematology , principle, advantages , cautions , basic interpretation of histograms.
10. basic principle and techniques in molecular diagnostics with special reference to haematological disorders.
11. composition of urine, collection & preservation , changes in relation to various diseases
12. different types of dip sticks available pros & cons
13. for estimation –indications, specimen collection & processing. Normal value & attention in pathological states
14. cavity fluids- transudate , exudates & abnormalities in disease state
15. semen analysis
16. non parasitological examination of stools including blood
17. quality assurance

Practicals

1. Preparation & examination of thin , thick, & wet blood films
2. Staining of blood smears by Romanowsky stains
3. Supravital staining & reticulocyte count
4. Bone marrow smears & staining
5. Iron stain
6. Peroxides stain
7. Recognizing & reporting of blood pictures, normal & abnormal
8. Methods of measuring haemoglobin
9. Total rbc , wbc, platelet count
10. Differential wbc count
11. Absolute eosinophil count
12. Recognition of blood parasites
13. Packed cell volume

14. Investigation of haemolytic anaemia including osmotic fragility, alkali denaturation, sickle cell preparation, haemoglobin electrophoresis, Kleihauer preparation, acid hemolysis test
15. LE cell preparation.

Clinical pathology

Urine

Composition of urine

Collection & preservation of urine

Changes in composition of urine in relation to various diseases

Principles of dry chemistry

Practicals

Complete urine analysis

Chemical-protein, reducing substance, ketone bodies, blood pigments

Sediments

Use of dip sticks in urine analysis

Cavity fluids & miscellaneous specimens

Extra vascular fluids, normal composition of transudate & exudates

CSF & alteration in diseases

Semen analysis

Non parasitological examination of stool including occult blood

Quality control – urine & extra vascular fluids

Practicals

Examination of CSF & reporting

Cavity fluids & reporting

Semen analysis

Stool occult blood

Microbiology-I & PARASITOLOGY & ENTOMOLOGY

Objectives

To familiarize the student with principles of general microbiology, immunology, routine methods of identification of bacteria & study of common parasites of man

Microbiology

Use of microscopes in microbiology

Review of the commonly used instruments, equipments & glass ware used in microbiology

Maintenance of glass wares used in microbiology

Sterilization & disinfection

Practicals

Preparation of stains & reagents

Preparation of media

Laboratory study of bacteria-hanging drop, simple stain, gram stain & special stain

Cultivation of bacteria

Isolation & identification of bacteria

Serology agglutination test, widal test, brucella agglutination & precipitation, VDRL.

Pathogenic parasites examination of clinical specimens

Insect vectors-practical & demonstration

THIRD YEAR

BIOCHEMISTRY

Course description: at the end of the course the student will be familiar with the investigations of liver & renal disorders, biochemistry of enzymes, lipid profile, gastric analysis, DNA structure, synthesis, transcription, protein synthesis & metabolism, etiology of cancer, tumor markers & formation of CSF will be covered. He/ she will also be introduced to the principles of automation and diagnostic kits including immune assays

Clinical biochemistry

1. Liver functions including bile pigment metabolism & bile salts.
2. Acid base balance including blood gas analysis & renal function tests
3. Lipoprotein metabolism
4. Gastric function tests
5. Enzymes of clinical importance
6. Principles & basic methods of automation
7. Principles of available diagnostic kits
8. Theory of competitive immuno assay, immunometric assay & immune turbidometry
9. Dna structure, replication, transcription & protein bio synthesis. Structure of DNA , nucleoproteins, introns, exons. Replication , DNA polymers, cell cycle, repair enzymes, linear damage & repair, restriction endo nucleases, messenger RNA transcription, elongation, termination, post transcriptional processing, transfer RNA , protein synthesis, genetic code, translation, initiation, elongation, termination, post translational processing, inhibitors of protein synthesis, mitochondrial DNA & RNA, operon hypothesis
10. Overview of some inborn errors of metabolism
11. Diagnostic usefulness of recombinant DNA technology. Defects arising from genetic mutations in familial hypercholesterolemia, cystic fibrosis, amino acid disorders, organic acidurias & Galactosemia & fructose intolerance.
12. Biochemistry of cancer:

Etiology of cancer, mutagens, carcinogens, selected tumor markers, alpha feto protein, CEA, PSA, beta-HCG, VMA, tumor markers in myeloma, Bence jones proteins, beta-2-microglobulin

Practicals:

Estimation of the following in serum

SGOT, AST

SGPT, ALT

ALP

Total; & direct bilirubin

Uric acid

Cholesterol
Fibrinogen
Urine protein
Introduction to the concept of southern, northern, western blots, PCR techniques,
therapeutic drug monitoring
Review of estimation of
Glucose
Urea
Creatinine
Total protein, albumin
Calcium, phosphate
Sodium, potassium
Urine qualitative bilirubin & urobilinogen

Coagulation & transfusion medicine

Aims:

Should be thorough with normal coagulation cascade, natural inhibitors of coagulation & normal fibrinolysis

Should be familiar with the common congenital & acquired coagulation factor deficiencies, their pathogenesis, inheritance patterns, clinical features & approach to diagnosis of the same

Should be able to perform the basic investigations related to the above.

Should be aware of thrombophilic states & investigations done for the same

Should understand the principles of immunohaematology & be competent to handle routine blood bank organisation & procedures.

1. Principles of coagulation & hemostasis
2. Sample collection, preparation & storage for hemostasis test
3. Lab diagnosis of bleeding disorders including platelet function abnormalities
4. All overview of hyper coagulable states % lab investigations for the same.
5. DIC- an overview & lab investigations for the same
6. Automation in the coagulation lab.
7. Quality assurance in the coagulation lab

Practicals:

1. Clotting time.

2. Clot retraction & clot lysis
3. Bleeding time
4. PT
5. APTT correction studies
6. factor assays
7. platelet function tests

Immunohaematology

1. Principles of blood groups & antigen antibody reactions
2. Genetics in blood banking
3. ABO & Rh blood group systems
4. Other red cell antigens & their antibodies- clinical significance
5. Red cell compatibility testing
6. coombs tests- significance
7. Antibody identification
8. Hemolytic disease of new born
9. Blood donor selection, screening
10. Transfusion transmitted diseases & their lab diagnosis
11. Blood collection & preservation including cryopreservation
12. Blood components, preparation, indications, storage and autologous transfusions.
13. Transfusions in transplantation, neonatology.
14. Blood substitutes
15. Blood donor motivation
16. Auditing in blood banks.
17. Quality assurance in blood banking practices
18. HLA- theory importance in transplantation, disease associations & basic techniques used in tissue typing.

Practical:

Blood collection & preservation using different anticoagulants& preservative solutions.

Component preparation

ABO grouping

Rh typing

Antibody direction & titration

Coombs test

Compatibility testing- cross matches

Investigation of transfusion reactions

Investigation of hemolytic disease of new born

HBsAg & HIV antibody testing in blood bank

Microbiology –II VIROLOGY, MYCOLOGY, ADVANCED SEROLOGY

Objectives:

To give the students a sound knowledge of pathogenic microbes, laboratory diagnosis, basic understanding of virology, mycology, & advanced serological techniques.

Systematic bacteriology:

Morphology, isolation, identification of pathogens, cocci, bacilli, spirochetes, vibrio, actinomycetes, laboratory diagnosis. Principle of anti microbial therapy-antibiotic susceptibility, common pathogenic fungi of skin, sub cutaneous tissue & deep organs- laboratory diagnosis.

Basic virology- common viral diseases, transmission, collection, dispatch .

Practicals:

Maintenance of stock culture

Identification of pathogenic organisms

Methods of collection of clinical material for culture-urine, blood, CSF, throat swab, faeces, body fluids

Separation of sera, preservation & transport for serological test.

Preparation of antibiotic discs & antibiotic susceptibility test.

Basic techniques of collections of specimens for direct examination of pathogenic fungi KOH lactophenol cotton blue method

Cultivation of fungi

Basic techniques of collection & transport of specimens for serological tests

Diagnosis of viral infections- isolation & serological test

Advanced serological techniques- ELISA, immunoelectrophoresis, immunodiffusion

Scheme of examination .

FIRST YEAR:

Sl. No.	Subject Title	I A		University Exam		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Human Biology	50	25	100	50	-		-	
2.	BASIC CHEMISTRY	50	25	100	50	100	50	-	-
3.	General methodology	50	25	100	50	100	50	-	-
4.	Physics & principles of instrumentation	50	25	100	50	-	-	50	25

SECOND YEAR:

Sl. No.	Subject Title	I A		University Exam		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Histopathology & cytology techniques	50	25	100	50	100	50	-	-
2.	Biochemistry I	50	25	100	50	100	50	-	-
3.	Clinical pathology & basic haematology	50	25	100	50	100	50	-	-
4.	Microbiology I & parasitology , entomology	50	25	100	50	100	50	-	-

THIRD YEAR:

Sl. No.	Subject Title	I A		University Exam		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
1.	Coagulation & transfusion med	50	25	100	50	100	50	-	-
2.	Biochemistry II	50	25	100	50	100	50	-	-
3.	Microbiology II	50	25	100	50	100	50	-	-
