SHSB1103	GENERAL ENGLISH LANGUAGE LEARNING I	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To improve the comprehension and critical thinking skills.
- To develop and integrate the use of the four language skills i.e., Listening, Speaking, Reading and Writing.
- To enhance the vocabulary knowledge by learning various strategies.
- To train academic and professional skills like interview skills, ICT and Presentation skills.
- To enable the learner to communicate effectively and appropriately in real life situation.

UNIT 1 LANGUAGE AT THE WORD LEVEL 9 Hrs.

Parts of Speech – Kinds of sentences- Tense- Voice-Impersonal Passive – Reading: Comprehension passages – Writing: Letter writing – Job Application with CV- Speaking: Self Introduction, listening: Introduction to Internet & World Wide Web - Creating and Managing Email Accounts

UNIT 2 LANGUAGE AT THE SENTENCE LEVEL 9 Hrs.

Concord- Phrases and Clauses-Adjectives and adverbs-Modals - Prefix-Suffix–Identifying topic sentence, Connectives and discourse markers - Writing: Paragraph Writing- Compare/ contrast paragraphs, Bar diagrams- Tabular columns– Listening: Using audio and video to learn vocabulary and grammar.

UNIT 3 WRITING FOR THE SCREEN 9 Hrs.

Reported Speech, Compound nouns, Abbreviations/ Acronyms- Types of Sentences- Simple, Compound, Complex-Transformation of sentences- Flow chart-Writing process descriptive paragraphs/drawing diagram from the paragraph –Creating and writing online quiz tests using Kahoot application- E-mail writing- letters inviting dignitaries-Accepting and Declining.

UNIT 4 LANGUAGE AT DISCOURSE LEVEL 9 Hrs.

Cloze reading exercises- Developing dialogues- Question tags- Instructions- Recommendations-Group Presentations - Preparing Checklist-Posting Online feedback for any article- Writing classified Advertisements- Argumentative Essay writing- Creating Blogs using wordpress.com.

UNIT 5 CREATIVE THINKING 9 Hrs.

Identifying the topic sentences by reading the content - Group discussions on a given topic – Mock interview – Story cluster – Rearrange the story – News report – Ad making - Writing Letters – Job application – Accepting/Declining job offers.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Analyse any piece of work critically employing reading and vocabulary strategies.
CO2 - Understand the importance of vocabulary words used in verbal and written conversation.
CO3 - Enhance critical thinking skills by composing questions in reasoning format.
CO4 - Equip themselves with professional soft skills to meet the industry demands.
CO5 - Construct and evaluate written discourse with advanced skill set.
CO6 - Equip the students with the required Professional Skills.

TEXT / REFERENCE BOOKS

1. Bhattacharya, Indrajit. An Approach to Communication Skills, Dhanpat Rai Co. Pvt Ltd; New Delhi.
2. Jones, Leo. Cambridge Advanced English: Student's Book New Delhi: Cambridge University Press,1998.
3. Mohan, Krishna and Meenakshi Raman. Advanced Communicative English. New Delhi: Tata McGraw Hill Company Ltd., 2010.
4. Rajendra, Pal and Korlhalli. Essentials of Business Communication. J.S.Sultan Chand & Sons, 2007
5. Seely, John. The Oxford Guide to Writing and Speaking Oxford: Oxford University Press, 1998.

English for Science and Technology (2013) by Department of English, Sathyabama

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1101	FUNDAMENTALS OF ANATOMY AND PHYSIOLOGY	L	T	P	EL	Credits	Total Marks
		4	0	0	2	4	100

COURSE OBJECTIVES

- To understand how organs and structures present and how they function and how both structure and function are modified by deficiency to disorder orpathology to disease will be understood**.**
- To achieve through demonstrations using prosected cadavers, student dissection, anatomical models, plastinated specimens, online learning modules, labeled gross specimens and models.

UNIT 1 THE SKELETAL SYSTEM&MUSCULAR SYSTEM 12 Hrs.

Bones – Types, structure, Axial & Appendicular Skeleton, Bone formation and growth, Description of bones. Joints –classification and structure. Alterations in disease, Classification, Structure and properties of muscles, Neuromuscular junction, Electromyogram and disorders of muscles.

UNIT 2 CARDIOVASCULAR AND LYMPHATIC SYSTEM 12 Hrs.

Blood, Blood groups, Hemoglobin and iron metabolism, Coagulation of Blood, Structure of heart, Cardiac cycle, Electrocardiogram, Blood Pressure, Circulation: systemic, pulmonary, coronary, Lymphatic system, Lymphatic vessels and Lymphatic tissues, Lymph nodes.

UNIT 3 RESPIRATORY SYSTEM & DIGESTIVE SYSTEM 12 Hrs.

Structure of the organs of respiration, Muscles of respiration: intercostal and Diaphragm Alterations in disease, Structure of Alimentary tract and accessory organs of digestions – Mouth, Stomach, Liver and Gall bladder.

UNIT 4 EXCRETORY SYSTEM, NERVOUS SYSTEM & SPECIAL SENSES 12 Hrs.

Kidney, Ureter, Urinary bladder, Urethra (male and female), Urine Formation, Structure of neuralgia & neurons, Somatic Nervous system, Structure of brain, spinal cord, cranial nerves, peripheral nerves, Autonomous Nervous system – sympathetic, parasympathetic Structure, location. Alterations in disease. Structure of, eye and ear, Physiology of vision, Auditory & Olfactory apparatus.

UNIT 5 REPRODUCTIVE SYSTEM 12 Hrs.

Male Gonad: Testes, Epididymis, Female Gonad: Ovary, Fallopian Tube, Uterus, Vagina and Mammary gland. Introduction of male Genital Organs, Introduction of female Genital Organs.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Use anatomical terminology to identify and describelocations and functions of major organs of each system covered.

CO2 - Understand the interrelation ships among molecular, cellular, tissue, and organ functions in each system Corre late the inter-dependency and interactions of the systems.

CO3 - Acquire knowledge about homeostatic imbalances

CO4 - Acquire knowledge about the causes.

CO5 - Understand the contributions of each organ and tissue system

TEXT / REFERENCE BOOKS

1. Human Anatomy and Physiology for Courses in Nursing and Allied Health Sciences 4th Ed, Yalayyaswamy N.N., CBS Publishers, 2017.
2. Ross & Wilson Anatomy and Physiology in health and Illness, Anne Waugh & Allison Grant, Elsevier,13thedition, 2013.
3. Fundamentals of Anatomy & Physiology, Judi L Nath, Edwin F.Bartholomew, Frederic H.Martini, Pearson, 9th Edition, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1102	BASICS OF BIOCHEMISTRY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- Aimstoprovideabasicunderstandingofthecoreprinciplesandtopics ofBiochemistry andtheirexperimentalbasis.
- To enable to perform routine as well as special investigative procedures in different specialties of Medical LaboratoryTechnology.

UNIT 1 Chemistry, metabolism & Clinical pathology of Carbohydrate 12 Hrs.

Chemistry of carbohydrates & their related metabolism - Introduction, definition, classification, biomedical importance Brief outline of metabolism: Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis, Diabetes mellitus, gestation diabetes mellitus, Hyperglycemia & hypoglycemia and its causes.

UNIT 2 Chemistry of Amino acids and Protein- Protein Metabolism and its clinical pathology 12 Hrs.

Amino acids -Definition, classification, essential &non-essential amino acids. Chemistry of Proteins - Introduction, definition, classification, structure, and its biomedical importance, Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatinine, Proteinuria.

UNIT 3 Chemistry of Lipids, Lipids metabolism & clinical Pathology 12 Hrs.

Introduction,definition, classification, biomedical importance, essential fatty acids. Non-essential fatty acids, Brief out line of metabolism: Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & it's clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis

UNIT 4 Enzymes and its clinical significance 12 Hrs.

Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc

UNIT 5 Acid base balance concepts & disorders 12 Hrs.

Water metabolism, Distribution of fluids in the body, ECF, ICF, dehydration. - pH, Buffers, Acidosis, Alkalosis

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Attain knowledge about the basics of biochemistry and the irimportance.
CO2 - Attain knowledge on carbohydrates, proteins, fats and their functions inthebody.
CO3 - Attain knowledge on the basic principles of metabolismandits regulation
CO4 - Understand the role of enzymes and its importance indiagnosis of various diseases.
CO5 - Understand the role of pH, buffer system and water balance in the body.
CO6 - Understand and access various biochemicalparametersanditsrelationtodiseaseanddysfunctionoforgans.

TEXT / REFERENCE BOOKS

1. Text book of Medical Biochemistry by MNChatterji & Rana Shinde, 7th Edition, Jaypee Publishers.
2. Handbok of Biochemistry & Nutrition by Shivanand Nayak B, by Jaypee publishers, fourth edition, 2020.
3. Harper's Illustrated Biochemistry 31st edition, by Lange Publishers, 2018.
4. Principles of Biochemistry by Voet & Voet fourth edition, Wiley publishers, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1103	BASIC MEDICAL LABORATORY SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- To know basic of laboratory management and laboratory management.
- To have basic understanding of reagents preparation, sample collection.

UNIT 1 INTRODUCTION TO SAMPLE COLLECTION 9 Hrs.

Methods of collection, Transport, packing and storing of specimens, importance of labeling and identification.

UNIT 2 PREPARATION OF SOLUTIONS 9 Hrs.

Units of weight and volume, Calculation of concentration and methods of expressing concentration of solutions, types of water and their properties and uses. Preparation of standard solutions and reagents, Calculation of concentration and dilution factor, Interconversion of concentration - Normal, Molar, Molal and Percentage solution. Preparation of reagents for various biochemical analysis, chemical indicators and theory of indicators.

UNIT 3 LABORATORY CHEMICAL & GLASSWARE AND ITS USES 9 Hrs.

Cleaning of glassware's, Types and use of pipettes and calibration of pipettes. Stores and supplies: Indenting, ordering, storage, shelf-life of various reagents and grades of chemicals. Grades of chemicals, storage and handling of chemicals and reagents.

UNIT 4 CALIBRATION AND VALIDATION OF CLINICAL LABORATORY INSTRUMENT 9 Hrs.

Principle and QC procedure for lab instruments - parts, principle, maintenance, and care of microscope. microscope, incubator, Hot air oven, Autoclave, Centrifuge, Colorimeter, Spectrophotometer, Flame photometer, Refrigerator, pH meter.

UNIT 5 LABORATORY SAFETY 9 Hrs.

First aid in the laboratory, Precautions for infective material, common lab accidents and their prevention, first aid. Handling of infective materials: General principles, laboratory hazards and safety measures, universal safety precautions.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the General knowledge of laboratory organization
CO2 - Understand the sample collection procedure
CO3 - To know about basic laboratory procedure and reagents preparation.
CO4 - To learn about laboratory chemical and glassware uses
CO5 - To know about Laboratory safety, and rules regarding safe disposal.
CO6 - To know about laboratory reporting, recoding procedures and management.

TEXT / REFERENCE BOOKS

1. MLT Text book of Anatomy and Physiology, Mahendra Kumar Gupta, 2003.
2. Anatomy for MLT & other Allied Courses, Dr. Renu Chauhan, APC Books, 2016.
3. Human Anatomy and Physiology for Courses in Nursing and Allied Health Sciences 4th Ed, Yalayyaswamy N.N., CBS Publishers, 2017.
4. Ross & Wilson Anatomy and Physiology in Health and Illness, Anne Waugh & Allison Grant, Elsevier,13thedition, 2013.

5. Fundamentals of Anatomy & Physiology, Judi L Nath, Edwin F.Bartholomew, Frederic H.Martini, Pearson, 9thEdition, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB2101	ANATOMY & PHYSIOLOGY LAB	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- To apply the anatomy and physiological concepts in laboratory techniques.

LIST OF EXPERIMENTS

1. Identification and description of all anatomical structures.
2. Demonstration of dissected parts (upperextremity, lowerextremity, thoracic & abdominalviscera, face and brain)
3. Demonstration of skeleton-articulated and disarticulated.
4. Determination of Bleeding Time.
5. Determination of Clotting Time by capillary tube method.
6. Estimation of Haemoglobin by sahli's method.
7. Measurement of pulse, blood pressure.
8. Enumeration of Red Blood Cellby Hemocytometer.
9. Enumeration of Total Leucocytesby Hemocytometer.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - understands the identification of human bones, types, classification and parts of the bones.
CO2 - recognize the structures and functions of major organs of the human body.
CO3 - Classifies the human blood based on their inherited properties of RBC, WBC, ABO antigens.
CO4 - Compare the major bones and their processes as they relate to each region of the body.
CO5 - understands the causes of symptoms, causes of hypertension and its diagnostic methods.
CO6 - interprets the reference range, purpose, causes, types of clotting time and bleeding time.

SAMB2102	BASIC BIOCHEMISTRY LAB	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the basic components of Practical Biochemistry.
- To identify and analyze biochemical parameters of various biological samples.

LIST OF EXPERIMENTS

1. Introduction: Aim, basis, interpretation, safety in clinical biochemistry Laboratory.
2. Laboratory organization Instruments, glassware, sample collection & specimen labeling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.
3. Identification of Carbohydrates (qualitative tests).
4. Identification of Proteins (qualitative tests).
5. To study general properties of the enzyme (Urease) & Achromatic time of salivary. amylase. Glucose tolerance test & Glycosylated hemoglobin.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Acquire knowledge about Instruments, glassware, sample collection & specimen labeling.
CO2 - Acquire knowledge about identifying different type of carbohydrates and proteins.
CO3 - Understand about the activity of urease and amylase.
CO4 - Acquire knowledge about estimation of glucose.
CO5 - Understand the various normal & abnormal constituents of urine.
CO6 - To know how to interpret results based on normal values.

SHSB1202	GENERAL ENGLISH LANGUAGE LEARNING II	L	EL	T	P	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To equip students to use the language effectively in daily life.
- To improve the knowledge of Computing and Information and Communication Technology.
- To find the relevance of grammar in conversational skills.
- To build the professional and industrial skills like Personality development and critical thinking, etc.
- To enhance creative writing for interactive media.

UNIT 1 LANGUAGE FOR EVERY DAY USAGE 9 Hrs.

Parts of speech- Tenses-Types of sentences - Degree of comparison – Dialogue writing- Building conversation with imaginary situation – Listening and Reading skills through teacher led practice – writing agenda for a meeting – note taking – Summary writing.

UNIT 2 SOCIAL MEDIA STRATEGIES 9 Hrs.

Editing the passage with respect to spelling, grammar and punctuation-Rearranging Jumbled sentences -Writing effective headlines – Giving feedback online-Letter to the editor- Problems and Solutions-Campaign Leaflet and Writing Film Review.

UNIT 3 LANGUAGE FOCUS 9 Hrs.

WH questions-Framing open-ended questions -Auxiliaries - Finites - Non – finites: Modal auxiliaries: Verbs: use of Transitive, Intransitive verbs - Phrasal verbs – Quantifiers- Identifying the odd word out-Collocations- Writing informal mails to friends and relatives

UNIT 4 PROFESSIONAL WRITING 9 Hrs.

Simile, Metaphor- Connotations- denotations- Idioms and Phrases-Letter to the editor with solutions to current problems –Essay writing- Paragraph writing – Line Graph- Creating Accounts - On line Groups - Twitter- Face book - Skype- Linked in - Research Gate-You Tube - Flicker.

UNIT 5 CREATIVE WRITING FOR INTERACTIVE MEDIA 9 Hrs.

Report Writing- Letter writing- Request for practical training-Projects – Creating PowerPoint Presentation and uploading – Creating Blogs and uploading data – Creative writing - stories and poems article writing and presentation.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Improve communication skills effectively in everyday conversation.
CO2 - Use ICT tools efficiently to improve communication skills.
CO3 - Enhance conversation skills, impromptu speech inculcating basic grammar.
CO4 - Equip themselves with professional soft skills to meet the industry demands.
CO5 - Construct creative article demanded for interactive media.
CO6 - Equip the students with the required Professional Skills.

TEXT / REFERENCE BOOKS

1. Bhattacharya, Indrajit. An Approach to Communication Skills, Dhanpat Rai Co. Pvt Ltd; New Delhi.
2. Rajendra, Pal and Korlhalli. Essentials of Business Communication. J.S.Sultan Chand & Sons, 2007

3. Seely, John. The Oxford Guide to Writing and Speaking Oxford: Oxford University Press, 1998
4. English for Science and Technology (2013) by Department of English, Sathyabama

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1201	CLINICAL BIOCHEMISTRY	L	T	EL	P	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To impart experiential learning to the students in order to develop a desired workforce to combat ever increasing demand of medical lab technicians in the healthcare sector.
- To enable the students to function efficiently, confidently and safely in clinical laboratory settings including hospital environments.

UNIT 1 PHOTOMETRY 12 Hrs.

Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.

UNIT 2 WATER, VITAMINS & ENZYMES OF CLINICAL IMPORTANCE 12 Hrs.

Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements. Fat- & water-soluble vitamins, sources, requirement, deficiency disorders & biochemical functions. Introduction to enzymes of clinical importance, Study on the distribution, clinical significance, and determination of AST, ALT, LDH and serum levels of LDH in pathological conditions. Study on the clinical significance and biological role of creatine kinase, alkaline phosphatase and gamma glutamyl transferase.

UNIT 3 LIVER & RENAL FUNCTIONS & THEIR ASSESSMENT 12 Hrs.

Based on: 1-Carbohydrate metabolism 2-Protein metabolism 3- Lipid metabolism 4-Measurements of serum enzyme levels 4-Bile pigment metabolism, Jaundice, its types and their biochemical findings. Detailed study on renal clearance and glomerular filtration rate and study on non-protein nitrogen containing compound. Study on biochemistry and physiology of urea and clinical significance of urea measurement. Detailed study on biochemistry and physiology of creatinine and creatine, clinical significance of creatinine clearance and plasma creatinine.

UNIT 4 LIPIDS AND CARDIAC PROFILE 12 Hrs.

Introduction to lipid profile tests and study on the diagnostic tests done for lipoprotein disorders, Study on the clinical significance of lipid profile test and the changes in values in different lipoprotein disorders like Atherosclerosis, Fatty streak, Fibrous Plague. In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases.

UNIT 5 ACID BASE BALANCE 12 Hrs.

Introduction, detailed study on the electrolyte composition of body fluids. Study on distribution of ions by passive and active transport and detailed study on Henderson –Hasselbach equation, study on bicarbonate carbonic acid buffer system, phosphate buffer system, plasma protein buffer system and haemoglobin buffer system. Study on isohydric and chloride shift, respiratory compensatory mechanism and renal compensatory mechanism in the regulation of acid- base. Detailed study on metabolic acidosis, metabolic alkalosis –classification, compensatory mechanism and laboratory findings. Detailed study on respiratory acidosis and respiratory alkalosis- classification, compensatory mechanism and laboratory findings.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the different analytical techniques for analyzing samples.
CO2 - Acquire knowledge about various diseases and their causes.
CO3 - Learn different types of immune techniques and its analysis of various microorganism.
CO4 - Demonstrate on various types of glucose estimation and its interpretation.
CO5 - Implement various methods to diagnose the lipid profile.
CO6 - Understand various deficiency diseases of vitamins and biochemicals.

TEXT / REFERENCE BOOKS

1. Textbook of Medical Biochemistry by MN Chatterjea& Rana Shinde, 7th Edition, Jaypee Publishers.
2. Analytical Biochemistry by Dr.P.Asokan, Chinnaa publications edition 3, 2010.
3. Principles of Biochemistry by Voet&Voet fourth edition, 2018, Wiley publishers.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1202	GENERAL MICROBIOLOGY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To develop an understanding of the basic concepts and terminology in general pathology and microbiology.
- To understand the methods of microbial staining, media, transport and control of microbial pathogens.

UNIT 1 GENERAL MICROBIOLOGY 12 Hrs.

General characters and classification of Bacteria - Characteristics of Bacteria - Morphology - Shape, Capsule, Flagella, Inclusion, Granule, Spore - Growth and Maintenance of Microbes - Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO2 - requirement, temperature, pH, light.

UNIT 2 STERILIZATION AND DISINFECTION IN MICROBIOLOGY 12 Hrs.

Definition of sterilization and disinfection, Brief description of various agents used in sterilization by physical method like sunlight, drying, dry heat, moist heat, filtration, radiation and ultrasonic vibrations., Sterilization by chemical methods – Alcohols, Aldehyde, Dyes, Halogens, Phenols, Surface-active agents, Metallic salts and gases., Sterilization by Gases &vapours by Ethylene Dioxide, Formaldehyde vapours., Testing of disinfectants to determine the efficiency of disinfectant.

UNIT 3 MEDIA & STAINING 12 Hrs.

Culture Media - Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media – Staining Methods - Simple, Grams staining, Ziehl - Neelsen staining or AFB staining, Negative Impregnation.

UNIT 4 COMMONLY USED INSTRUMENTS, EQUIPMENTS IN MICROBIOLOGY 12 Hrs.

Optical or light microscope, phase contrast microscope, dark field microscope, Fluorescence Microscopy, Electronic Microscopy, Safety hood chamber

UNIT 5 LABORATORY DIAGNOSIS IS BACTERIAL PATHOGENS 12 Hrs.

Collection and Transportation of Specimen - General Principles, Containers, Rejection, Samples- Urine, Faeces, Pus, Sputum Body fluids, Swab, Blood. Isolation of bacteria from clinical specimens. Primary media for isolation and their quality control - Antibiotic sensitivity discs, testing procedures and their quality control.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the basic samples collection and transport in microbiology lab.
CO2 - Demonstrate media and staining used in microbiology lab.
CO3 - Describe the role of various instruments in laboratory.
CO4 - To explore the scope of microbiology, microbial structure and their growth.
CO5 - Carry out the process of sterilization, media preparation, staining methods to control microbes.
CO6 - Acquire the knowledge to process various clinical samples and interpret the results.

TEXT / REFERENCE BOOKS

1. Microbiology with Diseases by Taxonomy Paperback by Bauman Robert W. (Author) 2017.
2. Textbook of Pathology - Harsh Mohan - 8th Edition (English) Paperback – 2019.
3. Robbins & Cotran Pathologic Basis of Disease: South Asia Edition Paperback – 2014.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1203	HOSPITAL AND LABORATORY MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	2	3	100

COURSE OBJECTIVES

- To help the students to know about Health care Management.
- Train them to acquire Family and Communal health knowledge.
- To be aware of with specimen collection procedures.

UNIT 1 PRINCIPLES OF HOSPITAL MANAGEMENT 9 Hrs.

Hospital planning - Organization of O.P & I.P., Ancillary services, Hospital statistics, Evaluation of patient care, Resource mobilization, Public Relations in Hospital. Human Resource Management Manpower planning - Recruitment procedures - Training and Development, Educational institutions and consultants - Principles and methods of executive development programmes - Performance appraisals, Job satisfaction.

UNIT 2 INVENTORY MANAGEMENT 9 Hrs.

Need for adopting materials management concept, Norms for inventory, Inventory carrying cost, Understocking, Overstocking - ABC analysis - Inventory reports - Materials handling, Store keeping and warehousing management.

UNIT 3 BOOK AND RECORD KEEPING 9 Hrs.

Meaning and Objectives – Double entry system, Trial balance, Profit and loss account, Preparation of balance sheet, Medical records Maintenance

UNIT 4 MANAGEMENT OF BIO-MEDICAL WASTE 9 Hrs.

Technologies for Treatment for BMW, Criteria for selecting appropriate Medical Waste Technologies

UNIT 5 GENERAL KNOWLEDGE OF LABORATORY ORGANIZATION 9 Hrs.

Reporting and recoding procedures, Ethics of laboratory practice including confidentiality of reports, medicolegal aspects of record keeping, Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the organization routine functioning and operational standards of laboratories.
CO2 - To be aware of with specimen collection procedures.
CO3 - Recognize the aware of pre analytical, analytical, analytical, and post analytical stages of processing.
CO4 - Apply the theoretical understanding to practical usage and recognize the latest trends and quality practices.
CO5 - To have a general understanding of the organization routine functioning.
CO6 - To know operational standards of laboratories.

TEXT / REFERENCE BOOKS

1. Gupta, Hospital & Health care Administration, 2000, Jaypee Brothers Medical Publishers, New Delhi.
2. Jha, S.M., Hospital Management, 2003, Himalaya publishing house, New Delhi.
3. Mohd.Faisal Khan, Hospital Waste Management, 2004, Kanishka publishers, New Delhi.

4. Shakti Gupta & Sunil Gupta, Hospital Stores Management – An Integrated Approach, 2000, Jaypee Brothers Medical Publishers, New Delhi. Social and preventive Medicine, K. Park, Brimnot publishers.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice	**20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks	**80 Marks**

SAMB2201	Clinical Biochemistry-Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To analyze the biochemical parameters in clinical samples.
- To identify the clinical significance of biochemicals in normal and pathological conditions.

LIST OF EXPERIMENTS

1. Blood urea estimation
2. Serum creatinine estimation
3. Serum uric acid estimation
4. Serum total protein, Serum albumin estimation and Serum globulin estimation
5. Serum glucose estimation
6. Total cholesterol, HDL cholesterol (direct), LDL cholesterol (direct) estimation, Triglyceride estimation
7. Serum Bilirubin total, Serum Bilirubin direct estimation
8. Serum amylase estimation
9. Serum GOT (AST) & Serum GPT (ALT) estimation
10. Alkaline phosphatase estimation
11. Acid phosphatase estimation
12. Serum sodium & Serum potassium estimation
13. Serum chloride estimation

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the lab safety measures and handling of glass and instruments.
CO2 - Acquire knowledge about handling instruments like colorimeter.
CO3 - Learn different types of estimation of glucose and lipids.
CO4 - Demonstrate on kidney function test which helps to assess the function of kidney.
CO5 - To know how toimplement various enzyme assays to monitor and measure the function of liver.
CO6 - Understand quantitative analysis of electrolytes to diagnose cardiovascular.

SAMB2202	General Microbiology Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To understand the principle and working of microscope and different types of microscopes.
- To learn basic microbial techniques.

LIST OF EXPERIMENTS

1. Components and settings of the Compound microscopeFocusing of the object, Use of low and high-power objectives of the microscope, Use of oil immersion lens.
2. Care and Maintenance of the microscope.

Different types of microscopes

- Dark field microscopy
- Fluorescence Microscopy
- Electronic Microscopy in brief.

3. Preparation of swabs/sterile tubes &bottles.
4. Preparation of smear.
5. Identification of Culture media.
6. Identification of instruments.
7. Identification of common microbes.
8. General requirements of collections, transport of clinical Specimens, Maintenance of stock culture.
9. Method of collection of clinical material for culture – urine, blood, sputum, and CSF, throat swab, faeces, body fluids.
10. Simple, differential and special staining of clinical materials viz: Throat swab, Pus, Urine, Sputum, Stool etc. Staining - Gram &Ziehl – Neelsen staining.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Analyze fundamental approaches for basic concepts about the microscope.
CO2 - Demonstrate about the preparation of smear using microbes.
CO3 - Describe about the staining procedures adopted to visualize microorganisms.
CO4 - Explore the knowledge to handle and maintain microbiological instruments.
CO5 - Recognize the procedures adopted for identification of microbes.
CO6 - Acquire knowledge about different morphology of bacteria, fungi and parasites.

SAMB1301	IMMUNOLOGY AND SEROLOGY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand the basic principles of immunity and serological diagnosis, vaccination, their schedules.
- To introduce the students to human immune reaction and molecular diagnosis for immune disorder.

UNIT 1 IMMUNITY 12 Hrs.

Definition and classification- General Principles of Innate & Acquired immunity - Immune Response - Humoral immunity & cell mediated immunity.

UNIT 2 ANTIGENS AND ANTIBODIES 12 Hrs.

Definition, classes and properties – Antibodies / Immunoglobulins - Definition, Properties, Sub types of Immunoglobulins.

UNIT 3 ANTIGEN ANTIBODY REACTIONS 12 Hrs.

Ag - Ab Reactions /Serological Refractions-Features of antigen / antibody Reaction – Precipitation – Agglutination - Complement fixation test – Neutralization – Opsonization – Immune adherence – Immunofluorescence - Immuno electron microscopic test.

UNIT 4 STRUCTURE AND FUNCTIONS OF IMMUNE SYSTEM 12 Hrs.

Parts of Immune system - T/B cells, other cells & their functions.

UNIT 5 HYPERSENSITIVITY REACTIONS AND AUTOIMMUNITY 12 Hrs.

General Principles of different types of hypersensitive reactions i.e., type I, II, III and IV, Autoimmune disorders, Vaccination- Schedule & Vaccines.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the basic structure of immune system.

CO2 - Know antigens and antibodies, and their reaction and Gain knowledge about defense mechanism of our body through innate immunity and acquired immunity.

CO4 - Enlighten about prophylaxis for infectious diseases through various types of vaccines and vaccination schedules.

CO5 - Gain knowledge about the role serological diagnosis.

CO6 - Learn about human parasites of medical and clinical importance.

TEXT / REFERENCE BOOKS

1. David Greenwood, Richard CD., Slack, John Forrest Peutherer. (1992). Medical Microbiology. 16th edition. ELBS with Churchill Livingstone.
2. Ananthanarayan, R. and JeyaramPaniker, C.K. (1994) Text Book of Microbiology, 6th Edn. Orient Longman, Chennai.
3. Alexopoulus CJ and C W. Mims. (1993). Introductory Mycology (3rd edition) Wiley Eastern Ltd, New Delhi.
4. Jagadish Chander (1996) A Text Book of Medical Mycology. Interprint, New Delhi.
5. Jewetz, E., Melnic, J.L. and Adelberg, E.A. (2000) Review of Medical Microbiology, 19th Edn. Lange Medical Publications, U.S.A

6. Topley & Wilsons's. (1990) Principles of Bacteriology, Virology and Immunity, VIII edition, Vol. III Bacterial Diseases, Edward Arnold, London.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1302	HEMATOLOGY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand basic disorders related to quantitative and qualitative abnormalities of red cells, WBC and platelets.
- To understand laboratory techniques used in diagnosis of blood cell disorders.

UNIT 1 OVERVIEW OF HEMATOPOIESIS AND BLOOD CELLS 12 Hrs.

Components of blood and their functions, Hematopoietic system of the body, Structure of bonemaroow, spleen red cell disorders, Anemias- classification and approach to diagnosis, Iron deficiency anemia, megaloblastic anemia, hemolytic anemias: Definition, causes and laboratory diagnosis.

UNIT 2 WHITE CELL AND PLATELET DISORDERS 12 Hrs.

Neoplastic and non-neoplastic disorders of WBC, classification and lab diagnosis of leukemia, chronic myeloproliferative disorders and other malignant disorders of the hematopoietic system, Platelet Disorders, Bleeding disorders I: Coagulation factor deficiencies – congenital, acquired Fibrinolytic defects Bleeding disorders II: Vascular disorders, Platelet disorders.

UNIT 3 COAGULATION 12 Hrs.

Basic Physiology, coagulation factors, Mechanism of blood coagulation, Extrinsic Pathway, Intrinsic Pathway, Regulators of blood coagulation – Factors, Regulation, Clinical Significance, Sample preparation, Anticoagulant used, Importance of use of Sodium, EDTA, Heparin.

UNIT 4 BLOOD COLLECTION 12 Hrs.

Separation Process, Separation of serum, Separation of plasma, Changes in blood on keeping, Maintenance of specimen identification, Transport of the specimen, Effect of storage on Blood Cell Morphology, Discarding procedures.

UNIT 5 BASIC HEMATOLOGY TECHNIQUES 12 Hrs.

Determination of Hemoglobin concentration, Calculation of blood cell indices MCV, MCH & MCHC, Estimation of erythrocyte sedimentation rate, Estimation of packed cell volume. Blood coagulation tests I, Bleeding Time, Duke's method, Clotting Time- Capillary tube method & Lee white's method. Blood coagulation tests II - PT, aPTT, TT, Clot retraction time, Determination of fibrinogen.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - The components of blood and the production of blood cells.
CO2 - The basic disorders related to quantitative and qualitative abnormalities of red cells.
CO3 - The basic disorders related to quantitative and qualitative abnormalities of White blood cells.
CO4 - The various anticoagulants used in blood collection.
CO5 - The process of blood collection by venipuncture and skin prick methods.
CO6 - To know Basics of automation in hematology.

TEXT / REFERENCE BOOKS

1. Dacie and Lewis Practical Haematology/ edition 12 (2017) by Barbara J. Bain.
2. Hand book of Medical laboratory technology, 2nd edition by Robert H Carman, Christian Medical Association of India (publishers).
3. Henry's Clinical Diagnosis and Management by Laboratory Methods / Edition 21 by Richard A. Mc Pherson MD, MSc, Matthew R. Pincus MD, PhD, Matthew R. Pincus.
4. Textbook of Medical Laboratory Technology/ edition 3 (2020) by Godkar P.B.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice	**20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks	**80 Marks**

SAMB1303	MEDICAL INSTRUMENTATION	L	T	P	EL	Credits	Total Marks
		3	0	0	2	3	100

COURSE OBJECTIVES

- To gain in depth knowledge about instruments employed for disease diagnosis.
- To provide complete exposure of various recording mechanism and to understand the basic principles and working of medical equipment's.

UNIT 1 INTRODUCTION AND GENERAL-PURPOSE EQUIPMENT 9 Hrs.

Basic Measurement system, Types of Biomedical equipment, Basic Audiometer – Bekesy audiometer, Pure tone & speech, Conventional hearing aids, BERA Test, Basic Spirometry. Auto Refractometer, Keratometer, Retinoscope, Tonometers.

UNIT 2 BIOMEDICAL RECORDER 9 Hrs.

ECG-Lead Configuration-Instrumentation set-up - effects of artifacts. IECG, EEG - 10- 20 Electrodes configuration - Instrumentation - recording of Evoked potentials, EMG - Measurement of nerve conduction velocity. ERG, EOG, EGG, PCG, TMT and Holter Monitors.

UNIT 3 IMAGING EQUIPMENTS 9 Hrs.

X-Ray machine, CT - Scanning system, processing unit, viewing part & storage unit. MRI - The magnet, RF transmitter system, Gradient system, imager system, Advantages. Ultrasonic imaging systems - A Scan, B Scan, TM Mode Scan, Echocardiography, Biomedical Applications Thermographic Equipment.

UNIT 4 FLOW METERS & PSYCOPHYSIOLOGICAL SYSTEMS 9 Hrs.

Flow meters and CO Measurement, Electromagnetic flow meters, Ultrasonic Blood flow meters, Laser Doppler Blood flow meters, Indicator Dilution method, Dye dilution method, Thermal dilution method. Polygraph GSR Measurement, Sensory and motor measurement, Plethysmography.

UNIT 5 PATIENT MONITORING SYSTEMS 9 Hrs.

BP measurement - Direct and indirect method, pulse rate analysis, temperature measurement, Respiration Rate, Apnoea Monitors, Central monitoring system. Endoscopy, Capusule Endoscopy, Laparoscopy, Oximetry, Foetal monitors, Cardiotocograph.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Characterize the sources of biomedical signals and their application in biomedical recorders.
CO2 - Understand and discuss about the various image acquisition machines.
CO3 - Compare the different flowmeters and dilution methods and discuss about sensory instrumentation.
CO4 - Discuss about the instruments associated with patient monitoring and its need in health care.
CO5 - Analyze the performance of instruments related to hearing and vision.
CO6 - To know how to apply the knowledge acquired to design diverse diagnostic equipment.

TEXT / REFERENCE BOOKS

1. R. S. Khandpur, Hand Book of Biomedical instrumentation, Tata McGraw Hill Publication, 2014.
2. John G. Webster, Medical Instrumentation, John Wiley & Sons, 2007.
3. Cromwell, Biomedical Instrumentation & Measurements Prentice-hall of India private limited, 2011.
4. Carr & Brown, Introduction to Biomedical Equipment Technology, 2001.
5. R. AnandaNatarajan, Biomedical Instrumentation & Measurements, PHI Publication, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice	**20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks	**80 Marks**

SAMB2301	Immunology and serology Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To know the fundamentals of invitro immune reactions.
- To understand immunological techniques to identify antigens.

LIST OF EXPERIMENTS

1. WIDAL Test.
2. VDRL Test.
3. RA Test.
4. CRP Test.
5. Pregnancy Test & HIV Test.
6. Serological techniques – Serology Agglutination, precipitation and compliment fixation.
7. Serological techniques ELISA, Immuno-electrophoresis.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Acquire knowledge about antigen and antibody reactions.
CO2 - Diagnose infectious diseases by immunological tests.
CO3 - Familiarize with the use of serological tests.
CO4 - Apply immune reaction in confirming pregnancy.
CO5 - Identify antigens and interpret immunodiagnostic reports.
CO6 - Acquire knowledge of various diagnostics tests and their interpretation.

SAMB2302	HEMATOLOGY-LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To understand the principle and equipment used in Haematology.
- To learn basic methods in determining blood count.

LIST OF EXPERIMENTS

1. Glassware for Hematology.
2. Equipment for Hematology.
3. Anticoagulant vial preparation.
4. Complete Blood Counts.
5. Determination of Hemoglobin.
6. TRBC Count by Hemocytometers.
7. TLC by Hemocytometer.
8. Differential Leukocyte count.
9. Determination of Platelet Count.
10. Determination of ESR by wintrobes.
11. Determination of ESR by Westergeren's method.
12. Determination of PCV by Wintrobes.
13. Erythrocyte Indices- MCV, MCH, MCHC.
14. Reticulocyte Count.
15. Absolute Eosinophil Count.
16. Morphology of Red Blood Cells.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Know various equipment used for basic hematological tests.
CO2 - Perform manual blood counts.
CO3 - Determine hemoglobin levels in blood sample by manual method.
CO4 - Determine ESR levels in blood sample by manual method.
CO5 - Prepare and stain peripheral blood smears.
CO6 - To know how to identify normal blood cells and determine differential leucocyte count in blood sample.

SAMB1401	TRANSFUSION MEDICINE	L	T	P	EL	Credits	Total Marks
		4	0	0	2	4	100

COURSE OBJECTIVES

- To understand the principles of immunohematology and be competent to handle routine blood bank organization and procedures.
- To understand structure and function of hemoglobin and hemoglobinopathies.

UNIT 1 PRINCIPLES OF BLOOD GROUPS AND ANTIGEN ANTIBODY REACTIONS 12 Hrs.

Blood Grouping, Introduction, Human Blood Group system, ABO Subgroups, Red Cell Antigen, Natural Antibodies, Rh System, Rh Antigens & Rh Antibodies, Hemolytic Disease of Newborn & Prevention, Principal of Blood grouping, antigen- antibody reaction, Agglutination, Hemagglutination, Condition required for antigen antibody reaction, Blood grouping techniques, Cell grouping, Serum grouping. Methods for ABO grouping. Slide & Tube Method, Cell grouping, Serum grouping, Rh grouping by slide & tube method, Difficulties in ABO grouping, Rouleaux formation, how it interferes with Blood grouping, Auto agglutinins, Antiserum used in ABO test procedures, Anti –A, Anti-B Anti- AB Antiserum, Inheritance of the Blood groups, Control, A&B Cells preparation, Auto control, Medical applications of Blood groups.

UNIT 2 PRINCIPLES AND PRACTICE OF BLOOD TRANSFUSION 12 Hrs.

Blood Transfusion, Principal & Practice of blood Transfusion, Guide lines for the use of Blood, **COURSE OBJECTIVES** of Quality Assurance in Blood Transfusion services, Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing, safety, procurement of supplies, Blood Donation, Introduction, Blood donor requirements, Criteria for selection &rejection, Medical history & personal details, Self-exclusion, Health checks before donating blood, Screening for TT.

UNIT 3 BLOOD COLLECTION AND PRESERVATION 12 Hrs.

Blood Collection, Blood collection packs, Anticoagulants, Taking & giving sets in Blood transfusion, Techniques of collecting blood from a doctor, Instructions given to the donor after blood donation, Adverse donor reaction, Testing Donor Blood, Screening donor's blood for infectious agents - HIV, HCV, HBV, Treponema palladium, Plasmodium, HTLV, bacterially contaminated Blood. Blood donor selection and screening Blood Donor Records, Blood donation record book, recording results, Blood donor card, Storage &Transport, Storage of blood, Changes in blood after storage, Gas refrigerator, Lay out of a blood bank refrigerator, Transportation, Maintenance of Blood Bank Records, Blood bank temperature sheet, Blood bank stock sheet, Blood transfusion request form.

UNIT 4 BLOOD COMPONENTS, PREPARATION, INDICATIONS, STORAGE AND AUTOLOGOUS TRANSFUSIONS 12 Hrs.

Blood components, preparation, indications, storage and autologous transfusions, Compatibility Testing, Purpose, Single tube compatibility techniques using AHG reagent, Emergency compatibility testing, Difficulties in cross matching, Labeling & Issuing cross- matched blood. Transfusion transmitted diseases & their lab diagnosis Collection of blood components for fractional transfusion, Platelets packed Red Cell, Platelet rich Plasma, Platelets concentrate, Preparation of concentrated (packed) Red cells, Techniques of preparation, Blood Transfusion Reactions, Investigation of a Transfusion reaction, Hemolytic transfusion reaction, Actions to take when transfusion reaction occurs.

UNIT 5 HEMOGLOBINOPATHIES 12 Hrs.

Distribution, morphology, kinetics of hemoglobin synthesis, Normal and abnormal hemoglobin molecules, anemia, thalasemia.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Learn the basics of blood grouping and cross matching.
CO2 - Understand the principles and the practice of blood transfusion.
CO3 - Familiarize with the use of routine tasks in blood collection and blood transfusion.
CO4 - Understand blood donor selection and screening and use them effectively in healthcare issues
CO5 - Get exposure to the scope and application of Blood components, preparation, indications, storage.
CO6 - Learn and implementing Transfusion transmitted diseases & their lab diagnosis.

TEXT / REFERENCE BOOKS

1. Dacie and Lewis Practical Haematology / edition 12 (2017) Barbara J. Bain.
2. Hand book of medical laboratory technology/ edition 2 Robert H Carman, Christian Medical Association of India (publishers).
3. Textbook of Medical Laboratory Technology/ edition 3 (2020) Godkar P.B.
4. Clinical Pathology, Hematology and Blood Banking (For DMLT Students)/ edition 3 (2017) Maheshwari Nanda.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1402	CLINICAL PATHOLOGY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To impart knowledge about the production, composition, normal & abnormal characteristics and lab evaluation techniques of body fluids.
- 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.

UNIT 1 URINE ANALYSIS 12 Hrs.

Composition of Urine, Collection of urine (midstream collection method, 24 hours urine collection), Preservation of urine. Physical examination of urine: Volume, Colour, odour, appearance, pH, specific gravity). Chemical Examination of urine: Protein, sugar, glucose, ketone bodies, billirubin, bile salts, bile pigments, urobillinogen, globulin).Microscopic examination of urine: Study of unorganized sediment for crystals found in acid urine like uric acid and urates, calcium oxalate, cystine crystals, leucine and tyrosine crystals. NH3 Biurate, Triple phosphate. Study of crystals found in alkaline urine, Detailed study of organized sediment for tubular cast, Hyaline cast, Granular cast, Epithelial cast, blood cell cast, pus cell cast, fatty cast, waxy cast. Study of microscopic identification and grading of red blood cells, pus cells, epithelial cells, Spermatozoa, bacteria, fungi and parasites.

UNIT 2 AMNIOTIC FLUID & SYNOVIAL FLUID 12 Hrs.

Amniotic fluid- Formation and function of amniotic fluid, Chemical composition, Collection, Testing – Alpha fetoprotein, Acetyl cholinesterase, Neural tube defects, Chromosomal abnormalities Haemolytic disease of newborn, Gestation age, Fetal maturation.Synovial fluid-Classification of joint disorders, non-inflammatory joint diseases – Osteoarthritis, Traumatic arthritis, Neurogenic joint disease. Inflammatory joint disease – Rheumatoid arthritis, Lupus arthritis, Cell count, Chemical and serological examinations, Clinical correlations.

UNIT 3 CEREBROSPINAL FLUID 12 Hrs.

Formation, Specimen collection, Causes of CSF pressure changes, Gross examination, Chemical analysis, Microbiologic examination, Immunologic tests, Cytological examination and clinical correlation.

UNIT 4 STOOL ANALYSIS 12 Hrs.

Importance of faeces examination. Macroscopic examination, Macroscopic examination for quantity, consistency and form, colour, blood, mucus in normal and in pathological conditions. Differences between Amoebic and bacillary dysentery stools, hanging drop preparation. Microscopic examination: Preparation of specimen for microscopic examination, saline preparation and iodine preparation. Preparation of smear by concentrated techniques by using Zinc sulphate flotation method, Formalin-ether concentration method. Fixation of faecal smear for permanent stain. Study of fixatives used in fixing smears. Permanent staining methods, their principle and procedure of staining. Chemical Test: Test for occult blood. Significance and the method of detection using Gum guaiacum, benzidine and orthotoludine. Principle, procedure and interpretation of results for above mentioned methods. Significance and method of detection for fat stercobilinogen and reducing substance.

UNIT 5 SEMEN ANALYSIS 12 Hrs.

Semen Analysis - Importance of semen analysis, detailed study of semen, formation of semen. Macroscopic examination of semen for volume, viscosity, colour and reaction in normal and pathological conditions. Definition of Oligospermia, azoospermia. Microscopic Examination: Preparation

of wet smear for motility of semen, preparation of seminal fluid for counting, counting of sperm using the counting chamber, method of counting and calculation of results. Staining of smear and morphological identification of Normal and abnormal sperm, pus cells and crystals.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Acquire knowledge about sample collection & specimen labeling.
CO2 - Acquire knowledge about identifying different type of biomolecules in body fluids.
CO3 - Understand and Acquire knowledge about estimation of biomolecules in body fluids.
CO4 - Understand the various normal & abnormal constituents of urine and other body fluids.
CO5 - Interpret results based on normal values.
CO6 - Understand the various physio pathological condition.

TEXT / REFERENCE BOOKS

1. Ramnik Sood, Concise Book of Medical Laboratory Technology (Methods and interpretation), 2nd Ed., N.A.Publishers, 2015.
2. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi, 2014.
3. Shirley Mitchell Lewis, Barbara J. Bain, Imelda Bates (2006) Dacieand Lewis Practical Haematology, 10th Ed, Churchill Livingstone/Elsevier.
4. Barbara A. Brown (2008) Hematology: principles and procedures 6th Ed Lea &Febiger.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1403	SYSTEMATIC BACTERIOLOGY & VIROLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To describe about the important medically important bacteria its mode of disease transmission, pathogenesis, diagnosis, prophylaxis and treatment.
- To aims at understanding important medically important virus and fungi its mode of disease transmission, pathogenesis, diagnostic method and treatment.

UNIT 1 COCCI AND ACID-FAST BACILLUS 9 Hrs.

Systematic Bacteriology - Staphylococcus, Streptococci, Neisseria, Corynebacterium and related organisms. Mycobacterium typical and atypical. Aerobic pathogenic Actinomycetes.

UNIT 2 ENTEROBACTERIACEAE 9 Hrs.

Vibrios, Helicobacter Pseudomonas, Brucella, Haemophilus, Bordetella. Enterobacteriaceae, Salmonella, Shigella, Proteus, Escherichia, Klebsiella.

UNIT 3 BACILLI AND SPIROCHETES 9 Hrs.

Bacillus, B. anthracis Clostridia, Mycoplasma, Rickettsia, Spirochetes, Treponema, Leptospira and Borrelia.

UNIT 4 MEDICAL IMPORTANCE OF DNA VIRUS 9 Hrs.

Introduction to Virology General characteristics of virus, Classification of virus, Pox, Herpes, Hepatitis B virus, Adeno virus.

UNIT 5 MEDICAL IMPORTANCE OF RNA VIRUS 9 Hrs.

Orthomyxovirus,paramyxovirus, Adenovirus, Arbovirus, HIV, Rabies, Morphology, cultural characteristics, pathogenesis/disease caused & lab diagnosis.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Learn an overview of medically important bacterial families like Enterobacteriaceae.
CO2 - Familiarize with bacilli and spirochetes.
CO3 - Understand laboratory diagnosis of bacterial pathogens.
CO4 - Learn and understand diagnosis of medically important viruses.
CO5 - Familiarize with RNA Virus.
CO6 - Understand laboratory diagnosis of various pathogens.

TEXT / REFERENCE BOOKS

1. David Greenwood, Richard CD., Slack, John Forrest Peutherer. (1992). Medical Microbiology. 16th edition. ELBS with Churchill Livingstone.
2. Ananthanarayan, R. and JeyaramPaniker, C.K. (1994) Text Book of Microbiology, 6th Edn. Orient Longman, Chennai.
3. AlexopoulusCJ and C W. Mims. (1993).Introductory Mycology (3rd edition) Wiley Eastern Ltd, New Delhi.
4. Jagadish Chander (1996) A Text Book of Medical Mycology. Interprint, New Delhi.
5. Jewetz, E., Melnic, J.L. and Adelberg, E.A. (2000) Review of Medical Microbiology, 19th Edn. Lange Medical Publications, U.S.A.
6. Topley & Wilsons's. (1990) Principles of Bacteriology, Virology and Immunity, VIII edition, Vol. III Bacterial Diseases, Edward Arnold, London.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice	**20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks	**80 Marks**

SAMB2401	Transfusion Medicine- Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To identify the practices essential for blood transfusion.
- To implement the procedures in maintaining blood bank.
- To learn the basic procedures in coagulation studies.
- To apply techniques in the storage and handling of blood specimens.

LIST OF EXPERIMENTS

1. Storage of blood specimens & Precautions to prevent hemolysis.
2. Bleeding time & clotting time estimation.
3. Prothrombin time estimation.
4. A PTT (activated partial thromboplastin time) estimation.
5. Clot retraction time.
6. TTI rapid tests.
7. Blood grouping & Rh typing.
8. Cross matching.
9. Direct Coombs test.
10. Indirect Coombs test.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Emonstrate about the techniques employed for storage of blood specimens.
CO2 - Estimate different time required for coagulation studies.
CO3 - Carry out Blood grouping & Rh typing.
CO4 - Perform cross matching.
CO5 - Familiarize with the use of Direct Coomb"s test and Perform indirect Coomb's test.
CO6 - To know how to analyze fundamental approaches in coagulation studies.

SAMB2402	Clinical Pathology Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To understand the basic components of Practical Biochemistry.
- To identify and analyze biochemical parameters of various biological samples.

LABORATORY EXPERIMENTS

1. Physical examination of urine.
2. Heat and acetic acid test.
3. Protein- salphosalicylic acid test.
4. Test for ketone bodies – rothera's test.
5. Test for bile pigment- fouchet's test.
6. Test for bile salt- hay's test.
7. Test for urobilinogen- ehrilisch's test.
8. Microscopic examination of urine.
9. Stool examination.
10. Microscopic examination of stool.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Acquire knowledge about sample collection & specimen labeling.
CO2 - Acquire knowledge about identifying different type of biomolecules in body fluids.
CO3 - Understand and Acquire knowledge about estimation of biomolecules in body fluids.
CO4 - Understand the various normal & abnormal constituents of urine and other body fluids.
CO5 - Interpret results based on normal values.
CO6 - To understand how to analyse body fluids analyse and interpretation.

SAMB1501	ANALYTICAL TECHNIQUES & BIOINSTRUMENTATION	L	T	P	EL	Credits	Total Marks
		4	0	0	2	4	100

COURSE OBJECTIVES

- Acquire theoretical knowledge about basic laboratory equipment's.
- Use the principles and applications of centrifugation and electrophoretic methods in laboratory.
- Demonstrate the use of spectroscopic techniques.
- Attain knowledge to use chromatographic techniques in research.

UNIT 1 BASIC PRINCIPLES AND CONCEPTS 12 Hrs.

Basic laboratory Instruments, Principle and QC procedure for lab instruments- parts, principle, maintenance, and care of microscope. microscope, incubator, Hot air oven, Autoclave, Centrifuge

UNIT 2 PHOTOMETRY 12 Hrs.

Colorimeter, Spectrophotometer, Flame photometer, Refrigerator, pH meter, Laminar-air flow, Spectroscopy- theory and applications of UV, Visible, IR, Fluorescence.

UNIT 3 CENTRIFUGATION TECHNIQUES 12 Hrs.

Basic principles, procedure and working mechanism of centrifugation- different methods of centrifugation techniques (zonal, differential, density gradiant and isopyenic centrifugation).

UNIT 4 ELECTROPHORETIC TECHNIQUES 12 Hrs.

Basic principles of electrophoresis, theory and application of paper, agarose. gel electrophoresis (vertical, horizontal)- polyacrylamide gel electrophoresis (PAGE)-SDS and isoelectric focussing.

UNIT 5 CHROMATOGRAPHIC TECHNIQUES 12 Hrs.

Principle, working methods and advantages of various chromatographic techniques (thin layer, gel filtration, ion exchange. (Adsorption and partition) -paper chromatography-column, ion exchange, Gas – liquid, affinity, molecular- exclusion, thin layer and HPLC.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the principles of basic instrumentation and their use in laboratory.
CO2 - Identify instruments and their uses.
CO3 - Recognize the types of separation techniques and their significance.
CO4 - Apply the theoretical understanding to practical usage of instruments.
CO5 - Bridge the gap between clinical and theory during practice of instruments.
CO6 - To know how to use various techniques in clinical lab.

TEXT / REFERENCE BOOKS

1. Rodney.F.Boyer, (2000), Modern Experimental Biochemistry, 3rdedn. Pearson Publication.
2. Jayaraman J (2011). Laboratory Manual in Biochemistry – 2nd edn - Wiley Eastrn Ltd., New Delhi.
3. Skoog A.,West M. (2014).Principles of Instrumental Analysis – 14th edn W.B. Saunders Co., Philadephia.
4. N.Gurumani. (2006). Research Methodology for biological sciences- 1 stedn - MJP Publishers.
5. Ponmurugan. P and Gangathara PB (2012). Biotechniques.1stedn- MJP publishers.
6. Veerakumari, L. (2009). Bioinstrumentation- 5th edn- MJP publishers, Chennai.

7. Webster, J.G. (2004). Bioinstrumentation- 4th edn - John Wiley & Sons (Asia) Pvt. Ltd, Singapore.
8. Chatterjea, M. N., &Shinde, R. (2011). Textbook of medical biochemistry. Wife Goes On.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1502	MEDICAL PARASITOLOGY & MYCOLOGY	L	T	P	EL	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- To understand the basic principles of immunity and serological diagnosis, vaccination, their schedules.
- To introduce the students to human parasites of medical and clinical importance.

COURSE CONTENTS

UNIT 1 GENERAL PARASITOLOGY 12 Hrs.

Definition - parasitism, host, vectors etc - Classification of Parasites - Phylum Protozoa- general Pathogenic and non – pathogenic protozoa. Protozoa - Intestinal Amoebae - E. histolytica: Life cycle, Morphology, Disease & Laboratory Diagnosis - E. coli : Life cycle, Morphology, Disease & Lab Diagnosis - Flagellates of intestine / genitalia - Giardia lamblia : Life cycle, Morphology, Disease & Lab Diagnosis – Trichomonas vaginalis : Life cycle, Morphology, Disease & Lab Malarial Parasite - Plasmodium vivax : Life cycle, Morphology, disease & lab diagnosis - Differences between P. vivax, P. malaria, P. falciparum and P.ovale-.

UNIT 2 PHYLUM NEMATHELMINTHS / ROUND WORDS (NEMATODA) 12 Hrs.

Nematodes - Intestinal Nematodes - Ascaris: Life cycle, Morphology, disease & lab diagnosis - Brief discussion about Enterobius vermicularis (Thread worm) and Ancylostoma duodenale (Hookworm) - Tissue Nematodes - W. bancrofti - Life cycle, Morphology, Disease & Lab Diagnosis.

UNIT 3 HUMAN PARASITES 12 Hrs.

Phylum Platyhelminths – class - Cestoda, class -Trematoda - Lab diagnosis of parasitic infections. Phylum Platyhelminths - Cestodes - T. solium, T. saginata and E. granulosus. Trematodes - S. haematobium & F. hepatica.

UNIT 4 SUPERFICIAL AND OPPORTUNISTIC MYCOSES 12 Hrs.

Introduction to Mycology, Dermatophytes and agents of superficial mycoses, Trichophyton, Epidermophyton and Microsporum. Opportunistic mycoses, Candidiasis, Cryptococcosis, Aspergillosis.

UNIT 5 SUBCUTANEOUS AND SYSTEMIC MYCOSES 12 Hrs.

Systemic mycoses Histoplasmosis, Coccidioidomycosis, Blastomycosis. Subcutaneous mycoses, Mycetoma, Morphology, cultural characteristics, pathogenesis/disease caused & lab diagnosis.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the basic of parasitology.
CO2 - Gain knowledge about various parasite and their life cycle, lab diagnosis.
CO3 - Enlighten about prophylaxis for parasitic diseases and knowledge about the diagnosis.
CO4 - Learn about superficial, systemic and opportunistic mycoses.
CO5 - Learn and understand diagnosis of medically important mycoses.
CO5 - To know about medical importance pathogens and their laboratory diagnosis.

TEXT / REFERENCE BOOKS

1. David Greenwood, Richard CD., Slack, John Forrest Peutherer. (1992). Medical Microbiology. 16th edition. ELBS with Churchill Livingstone.
2. Ananthanarayan, R. and JeyaramPaniker, C.K. (1994) Text Book of Microbiology, 6th Edn. Orient Longman, Chennai.
3. Alexopoulus CJ and C W. Mims.(1993).Introductory Mycology (3rd edition) Wiley Eastern Ltd, New Delhi.
4. Jagadish Chander (1996) A Text Book of Medical Mycology. Interprint, New Delhi.
5. Jewetz, E., Melnic, J.L. and Adelberg, E.A. (2000) Review of Medical Microbiology, 19th Edn. Lange Medical Publications, U.S.A.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB1503	BIO-MEDICAL WASTE MANAGEMENT	L	EL	T	P	Credits	Total Marks
		4	0	0	0	4	100

COURSE OBJECTIVES

- Acquire knowledge about the History and the development of biotechnology.
- Role of genetic engineering in laboratory and research.

UNIT 1 HOSPITAL HAZARDS AND INFECTIONS 12 Hrs.

Nosocomial infections – Safety measures to be carried out in Hospital environment, Hospital waste management.

UNIT 2 PRESENT SCENARIO- BIO-MEDICAL WASTE 12 Hrs.

Concepts and Perceptions, Waste Generation, Segregation, Disposal, Handling of waste, waste segregation and management including disposal, Laboratory accidents, prevention, first aid.

UNIT 3 PLANNING AND OBJECTIVES OF BMW MANAGEMENT 12 Hrs.

Survey, Policies and Perspectives of BMW Management, Legal Aspects and Environment Concern, Implementation of Action, Approaches to Common Regional facility.

UNIT 4 PERSONAL HYGIENE 12 Hrs.

Self-health maintenance, Family hygiene – group health care by vaccination – propitiation and prevention – Sanitation and diet patterns, Mass – Hygiene (Social Hygiene) – Environmental Hygiene - Training, Occupational Safety and Health Issues.

UNIT 5 HEALTH DISASTER MANAGEMENT 12 Hrs.

Disaster management techniques like epidemic eruption control, management and eradication.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - To acquire knowledge of Hospital hazards and infections.
CO2 - Gain basic understanding of Bio-medical waste and disposal.
CO3 - Equipped with various Legal Aspects and Environment Concern.
CO4 - To get familiarize with understanding of Personal Hygiene.
CO5 - To get familiarize with understanding of Health Disaster Management.

TEXTBOOK/ REFERENCES

1. The Book of Hospital Waste Management: Dr. D.B. Acharya & Dr. Meeta Singh (Minerva Press, New Delhi).
2. Hospital Waste Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi).

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB2501	ANALYTICAL TECHNIQUES & BIOINSTRUMENTATION-LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Acquire practical knowledge about laboratory instrumentations.
- Acquire knowledge about applications of centrifugation and electrophoretic methods in laboratory.
- Demonstrate the use of spectroscopic techniques.
- Attain knowledge to use chromatographic techniques in research.
- Apply molecular techniques in analysis & research.

LIST OF EXPERIMENTS

1. Centrifugation techniques Lab-Separation of blood WBC using fycoll reagent.
2. Chromatographic techniques Lab Demonstration of Paper chromatography.
3. Electrophoretic techniques- Demonstration of Agarose gel electrophoresis.
4. Electrophoretic techniques-Immunoelectrophoretic in agarose gel to see Ag-Ab reactions.
5. Molecular techniques- Demonstration of DNA extraction and quality check.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the basic instrumentation and their use in laboratory.
CO2 - Identify instruments and their uses.
CO3 - Recognize the types of separation techniques and their uses in lab diagnosis.
CO4 - Apply the practical knowledge and understanding to usage of instruments.
CO5 - Bridge the gap between clinical and theory during practice of instruments
CO6 - To acquire knowledge about various laboratory techniques

SAMB2601	MEDICAL MICROBIOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To learn the basic procedures in handling clinical specimens.
- To apply microbial techniques in the identification of pathogens.

LIST OF EXPERIMENTS

1. Isolation of bacterial pathogens from clinical specimens their biochemical reactions.
2. Identification of pathogenic organisms- Methods of enriched, selective and enrichment culture techniques used to isolate organisms from clinical materials.
3. Antibiotic sensitivity discs, testing procedures and their quality control, Antimicrobial Sensitivity testing by disc-diffusion technique.
4. Microscopic identification and cultural characteristics of medically important fungi, Candida, germ tube test.
5. Cultivation of fungi- Basic techniques of collection of specimens for direct examination of pathogenic fungi by KOH, Lactophenol blue method, KOH and Lacto phenol preparations for skin scrapings for dermatophytes.
6. Basic techniques of collection and transport of specimens for virological studies.
7. Identification of pathogenic viruses in Slides/ Smears / Spotters.
8. Diagnosis of viral infections – isolation and serological tests.
9. Examination of clinical specimens for pathogenic parasites, Stool examination, Identification of different ova & cysts in stool samples.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Analyze fundamental approaches for processing of clinical specimens.
CO2 - Demonstrate about the techniques employed for enrichment of microbes.
CO3 - Describe about the various staining procedures adopted to differentiate various group of microbes.
CO4 - Enumerate the technique to isolate and estimate the microbes in urine sample.
CO5 - Explore the identification of medically important fungi.
CO6 - Acquire the knowledge about different morphology of bacteria, fungi and parasites.

SAMB1601	HISTOPATHOLOGY & CYTOLOGY TECHNIQUES	L	T	P	EL	Credits	Total Marks
		4	0	0	2	4	100

COURSE OBJECTIVES

- To be able to fix, process, embed tissues and make sections for micro section studies.
- To be competent to make routine cytological preparation.

UNIT 1 INTRODUCTION TO HISTOPATHOLOGY AND CYTOPATHOLOGY TECHNIQUES 12 Hrs.

Basic concepts and principles. Applications, Reception of specimens– Criteria, Requisites, Container, Identity, Labelling, Rejection.

UNIT 2 TISSUE PROCESSING 12 Hrs.

Basic steps, fixing –Types of fixatives, Factors, Dehydration, Embedding, Staining, Mounting, Methods of decalcifications.

UNIT 3 CYTOLOGY 12 Hrs.

Introduction to FNAC and Exfoliative cytology, Processing of fluids- Sputum, bronchial aspirates, bronchial washings, gastric washings, Urine and other watery fluids, Cerebrospinal fluid.

UNIT 4 EQUIPMENT 12 Hrs.

Microscope, Microtome -Types, Uses, Parts, different types of microtome knives, care and maintenance, Automated tissue processor- components, working and precautions during use, Tissue floating bath.

UNIT 5 STAINING 12 Hrs.

Hematoxylin and Eosin staining, preparation of hematoxylin and eosin stains, Reticulin stain, PAP staining- components and methods.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Identify the basic structure of cells, tissues and organs and describe their contribution to normal function.

CO2 - Interpret light- and electron-microscopic histologic images and identify the tissue source and structures.

CO3 - Demonstrate common histology procedures such as embedding tissue in paraffin

CO4 - To know about tissue sectioning and mounting, or routine staining of tissue sections

CO5 - Describe common histology laboratory procedures used to prepare stained slides from tissue samples.

CO6 - Outline the principles of histochemistry and types of microscopies utilized in histology

TEXT / REFERENCE BOOKS

1. Bancroft's Theory and Practice of Histological Techniques by John D Bancraft /Edition 8 (2018)
2. Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques / edition 3 (1974) by C. F. A. Culling.
3. Hand book of medical laboratory technology, 2nd edition by Robert H Carman, Christian Medical Association of India (publishers).
4. Textbook of Medical Laboratory Technology/ edition 3 (2020) by Godkar P.B.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB2601	HISTOPATHOLOGY & CYTOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To learn the basic histological and cytological procedures.
- To understand the diagnostic applications of histological and cytological methods.

LIST OF EXPERIMENTS

1. Hematoxylin and Eosin staining.
2. PAP staining.
3. Embedding.
4. Microtome: Uses, care and parts.
5. PAS stain.
6. Pearls stain.
7. Reticulin stain.
8. Giemsa stain.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Demonstrate proficiency and expertise in the proper use of the light microscope in examining histological specimens on glass slides.

CO2 - Understand the basic concepts of tissue fixation, dehydration, embedding, sectioning, staining and mounting of slides for histological examination, immunofluorescent staining and electron microscopy.

CO3 - Differentiate the characteristics of tissues of the body (epithelium, connective, muscle, nerve) and their relationships in the various organ systems of the human body.

CO4 - Identify the histological features of selected tissues/organ systems resulting from disease processes.

CO5 - Examine how certain diseases can be diagnosed using histological and cytological methods.

CO6 - To know demonstrate common histology procedures such as embedding tissue in paraffin, tissue sectioning and mounting, or routine staining of tissue sections.

SAMB3001	GOOD LABORATORY PRACTICE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- The course of study enhances student's knowledge on essential practices that need to be followed inside a laboratory / industry.
- The course of study enhances student's awareness on safety measures and Industry standards.
- Student will get familiar to good lab practices including awareness/ safety in a clinical lab.

COURSE CONTENTS

UNIT 1 INTRODUCTION TO GOOD LABORATORY PRACTICE 9 Hrs.

Overview of GLP principles and objectives, Historical development and regulatory framework of GLP, Roles and responsibilities of different stakeholders, Understanding the importance of GLP in research and development, Clinical laboratory professional duty to the patient, duty to colleagues and other professionals, Good Laboratory Practice (GLP), Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation.

UNIT 2 ETHICS IN MEDICAL LABORATORY PRACTICE 9 Hrs.

Ethics in relation to Pre-Examination procedures, Examination procedures, reporting of results, preserving medical records Procurement of equipment and Inventory Control,

UNIT 3 DOCUMENTATION AND RECORD KEEPING 9 Hrs.

Importance of accurate and complete documentation, Types of laboratory records and their purpose, Standard operating procedures (SOPs) and protocols, Data recording, organization, and archiving, good documentation practices and electronic data management systems.

UNIT 4 QUALITY CONTROL IN THE LABORATORY 9 Hrs.

Understanding quality assurance (QA) and quality control (QC), Equipment calibration and maintenance, Method validation and verification, Analytical quality control (AQC) and proficiency testing, Handling and disposal of laboratory reagents and samples.

UNIT 5 SAFETY AND REGULATORY COMPLIANCE 9 Hrs.

Laboratory safety guidelines and regulations, Hazard identification and risk assessment, Personal protective equipment (PPE) and safety protocols, Chemical handling, storage, and waste management, Compliance with relevant regulatory bodies (e.g., FDA, EPA).

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Student will have knowledge of Ethical Principles and standards for a clinical laboratory
CO2 - Acquire knowledge about laboratory practice, to know about Ethics in Medical laboratory Practice.
CO3 - Knowledge of instrument calibration and importance.
CO4 - Awareness on safety measures and Industry standards.
CO5 - Understand the Good Laboratory guidelines.
CO6 - Apply the knowledge of Health care & Awareness in laboratory practice.

TEXT / REFERENCE BOOKS

1. Milton A. Anderson GLP Essentials: A Concise Guide to Good Laboratory Practice, Second Edition 2nd Edition, Published by CRC press.
2. Teitz, (2007), Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications.
3. Bishop (2013), Clinical Chemistry,7th edition, Wiley Publications.
4. Henry's Clinical Diagnosis and Management by Laboratory Methods, (2011),22nd edition, Elsevier.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**

SAMB3002	Advanced Diagnostic Techniques	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide an advance foundation in Laboratory Techniques where which is an emerging discipline with a broad conceptual approach that transcends all sections of advance molecular techniques.

COURSE CONTENTS

UNIT 1 INTRODUCTION TO MOLECULAR DIAGNOSIS OF GENETIC DISEASES 9 Hrs.

Laboratory application of nucleic acid technologies to elucidate, diagnose, monitor disease state and to evaluate non-disease status techniques for the detection of DNA, and RNA structures at the molecular level

UNIT 2 MOLECULAR DIAGNOSTICS 9 Hrs.

Basic principles and techniques-nucleic acid biochemistry-Relation to laboratory evaluation of disease and establishing a molecular diagnostic laboratory facility, equipment, personnel. Clinical testing process, quality assurance, clinical validation and accreditation.

UNIT 3 MOLECULAR GENETICS 9 Hrs.

Molecular diagnosis of genetic diseases. Choice of techniques, choice of applications, special concept unique to molecular genetic disorders, specific disease examples. Application of molecular methods in clinical microbiology.

UNIT 4 MOLECULAR TECHNIQUES 9 Hrs.

PCR techniques and their applications. Blotting techniques (Southern, Northern and western).

UNIT 5 MODERN ADVANCED TECHNIQUES 9 Hrs.

Biochips, Lab on a chip (LoC), Microarray technology: basic methodology and application.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Apply knowledge of molecular structure and genetic function, especially DNA and RNA.
CO2 - Understand the molecular diagnostic procedures relates to DNA replication.
CO3 - To know about Molecular genetics and function of different types of nucleic acid.
CO4 - Apply the knowledge of molecular testing in the clinical laboratory.
CO5 - To know about molecular testing in the clinical laboratory.
CO6 - To learn most commonly performed applications in the clinical laboratory.

TEXT / REFERENCE BOOKS

1. Blackburn, G.M. and Gait, M.J. (1996). Nucleic acids in chemistry and biology. Oxford University Press.
2. Bruce Alberts, Dennis Brag, Julian Lewis, Martin Raff, Keith Roberts, James D. Watson. (1994). Molecular Biology of cell. Garland Publishing Inc.
3. Hames, B.D. and Rickwood, D. (1990). Gel Electrophoresis – A Practical Approach, Oxford University Press, New York.
4. Sambrook, J and Russell, D.W. (2001). Molecular Cloning – A Laboratory Manual, 3rd Edition, Vol I, II, III, Cold Spring Harbour Laboratory Press, New York.
5. Westermeier, R. (1993). Electrophoresis in Practice, VCH, Federal Republic of Germany.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice	**20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks	**80 Marks**

SAMB3003	LABORATORY AUTOMATION & QUALITY CONTROL	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce the concept of quality management, to apply the significances of analysers in automation.
- To apply the significances of analyzers in automation and to introduce the concept of quality management.

UNIT 1 AUTOMATION 9 Hrs.

Introduction to automation, study on the instrumental concepts and definition of batch analysis, sequential analysis, discrete analysis etc. Detailed study on the steps in automated analysis, reagent handling, chemical reaction phase, reaction vessels, cuvettes in discrete analyzers and measurement using absorbance, electrochemical measurements and transmittance photometry.

UNIT 2 AUTO ANALYZERS 9 Hrs.

Continuous flow analyzers, discrete and Centrifugal analyzers auto analyzers-advantages, Dry chemistry analyzers, Random access analyzers (RAA), Micro particle enzyme immunoassay, Immulite automated immunoassay analyzers.

UNIT 3 CELL COUNTERS 9 Hrs.

Study on the different type of cell counters, available and their principle of operation, basic principle in estimating each parameter. Brief study on the operation and quality control of automated laboratory analyzers.

UNIT 4 INTRODUCTION TO QUALITY CONTROL 9 Hrs.

Demonstration of various methods of quality control, Preparation of Quality control charts, a) Levy-Jennings and b) Cusum charts. Demonstration of various methods of quality control- Westgard Rules to verify trends, biases, or errors in quality controls.

UNIT 5 QUALITY CONTROL PROGRAMME 9 Hrs.

External quality control, Internal Quality control, Proficiency testing, Total quality management framework, Quality laboratory processes, Quality assurance, Quality assessment, Current trends in laboratory accreditation, ISO certificate, Quality planning and Quality improvement.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to know

CO1 - Understand the principles of automation.
CO2 - Identify role of automation in flow analyzers.
CO3 - Recognize the types of analyzers and their significance.
CO4 - Apply the theoretical understanding to practical usage.
CO5 - Recognize the latest trends and quality practices.
CO6 - Bridge the gap between clinical and industry in theory and and practice of automation.

TEXT / REFERENCE BOOKS

1. Laboratory management – Quality in Laboratory diagnosis – Candis A Kinkus, Demos medical publishers, 2011.
2. Quality control in Laboratory – Gaffar Sarwar Zamman, Intech open publishers, 2011.
3. Clinical Diagnosis and Management by Laboratory Methods, Henry 23rd edition, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100 **Exam Duration: 3 Hrs.**

Part A : 10 Questions of 2 marks each-No choice **20 Marks**
Part B : 2 Questions from each unit of internal choice, each carrying 16 marks **80 Marks**