

**BHARATHIAR UNIVERSITY, COIMBATORE 641 046**  
**CENTRE FOR COLLABORATION OF INDUSTRIES AND INSTITUTIONS (CCII)**  
**ADVANCED DIPLOMA IN CLINICAL LABORATORY SCIENCE (2 years)**

(For the CCII students admitted from the academic year 2015-16 onwards)

**1. Description of course / objective of the course**

This course is designed to prepare technicians with specialized skills, knowledge and attitude to work in a clinical laboratory.

The program will be conducted at a hospital recognized by Bharathiar University under the CCII program. Candidate shall abide by the stipulated timings, discipline, rules and regulations of the hospital to which they will be assigned for the entire course.

**2. SCHEME OF EXAMINATION**

Sl.No	Study Components	Instruction Hours/ Week	Examination			
			Duration	CIA@	University Exam	Total
<b>1<sup>st</sup> Semester</b>						
1.	Paper I - Human Anatomy & Physiology	5	3	25	75	100
2.	Paper II - Biochemistry I	5	3	25	75	100
3.	Paper III - Microbiology	5	3	25	75	100
4.	Practical I: Biochemistry I	5	3	40	60	100
5.	Practical II: Microbiology	5	3	40	60	100
<b>2<sup>nd</sup> Semester</b>						
6.	Paper IV - Biochemistry II	5	3	25	75	100
7.	Paper V - Haematology / Clinical Pathology / Blood Banking	5	3	25	75	100
8.	Paper VI - Histopathology, cytology	5	3	25	75	100
9.	Practical III: Haematology / Clinical Pathology / Blood Banking	5	3	40	60	100
10.	Practical IV: Histopathology, cytology	5	3	40	60	100
<b>3<sup>rd</sup> Semester</b>						
11.	Paper VII - Biochemistry, Microbiology & Haematology	5	3	25	75	100
12.	Practical V: Biochemistry II	5	3	40	60	100
13.	Practical VI: Microbiology & Hematology	5	3	40	60	100
<b>4<sup>th</sup> Semester</b>						
14.	Internship/ Project work- Viva Voce *	-	-	-	-	200
	<b>Total</b>					<b>1500</b>

\* For Project Report 80% Marks & Viva-Voce 20% Marks

**3. Eligibility**

- a. Pass in +2 examination
- b. B. Sc graduates can also apply.

**4. Duration of the course**

The course shall extend over a period of 2 Years.

**5. Practical training**

Being a practical oriented program, the focus will be more on practical training. The candidate shall undergo practical training in doing the laboratory tests of various kinds in the laboratories or hospitals of Bharathiar University affiliated institutions.

**First Semester: PAPER I**  
**HUMAN ANATOMY & PHYSIOLOGY**

**UNIT I**

**General Anatomy** - Organization of Organisms: Cell-Structure and Function; Tissue: Classification and Function - Human Anatomy: Introduction; Position, location and fundamental planes, Clinical terms – General Histology: Definition and meaning - Slide preparation: Fixing: Chemical fixation with formaldehyde or other chemicals; Processing: Dehydration, clearing, and infiltration; Embedding; Sectioning; Staining; Common laboratory stains.

**UNIT II**

**Skin and connective tissue** - Skin: Definition of Skin; Layers of skin; Types of skin; Functions

**The Skeletal system** – Classification- bone structure, bone cells, bone marrow, bone growth, ossification, parts of a long bone - Major components a) Bone- definition, synonym, Composition, Special features & Function, Classification, features of a long bone, Bone marrow; b) Cartilage-definition; Components and classification -Joints: Definition of Joints; Functions; Classification of Joints based on – Structure and Function.

**UNIT III**

**The Muscular System** – Introduction; muscle tissue types; Skeletal muscles - Brief knowledge of Appendicular muscles & Axial muscles.

**The Circulatory System** - Basics of circulatory system - The Heart: features; Shape and Size; Position; Layers; Cardiac muscles; Chambers of heart and associated blood vessels; Valves; Blood supply; vessels related to heart; Functions - Lymphatic system: Introduction; brief overview of lymph nodes

**The Respiratory system** - Introduction: Cellular respiration; Classification- Anatomy of Larynx; trachea and bronchial tree - Lungs: Anatomical position; relations; lobes; fissures; broncho-pulmonary segments; Pleura: Layers of pleura and Pleural cavities.

**UNIT IV**

**General Physiology** - Introduction - Meaning; Homeostasis; Cell; Body fluid; Transport through cell membrane - Passive Processes; The Principle of Diffusion; Simple diffusion; Facilitated diffusion Osmosis; Active Processes - Active Transport; Transport in Vesicles; The Primary Tissue; Organs and systems.

**Blood** - Red blood cells: Erythropoiesis; stages; differentiation; Functions; Blood cells count; variations - Hemoglobin: Structure; function; concentration; physiological variation; Methods of estimation of Hb - White blood cell: Production; function; life span; count; differential count- Platelets: Origin; normal count; morphology; functions; Coagulation; Coagulants & anti-coagulants - Blood groups: A, B, O system; Blood grouping and typing; Cross-matching; Rh system-Rh factor; Rh in cross matching; Blood transfusion – indication, universal donor and recipient concept; Selection criteria of blood donor; Disorders of white blood cells, Platelets and Clotting.

**Gastrointestinal system** - Physiological anatomy of GIT; Stomach, and intestine, Absorption of nutrients from digested food; Role of bile in the digestive process.

**UNIT V**

**Respiratory system** - Respiratory system physiology; Introduction; measurements of respiratory rates and volumes; gas laws; gas exchange; oxygen and carbon dioxide transport in the blood.

**Nerve muscle Physiology** - Resting membrane potential; Action Potential - Physiology of nerves and neuromuscular junction Neuro muscular transmission - Overview of muscular system: Muscle Physiology; Muscle fiber; Muscle contraction; the sliding filament model of muscle contraction - Involuntary muscles: Cardiac and smooth muscles.

**Cardiovascular and lymphatic system** – Introduction; Cardiac muscle; the cardiac conducting system - The electrocardiogram: ECG and applied physiology - Cardiac output - Blood pressure: Control, fluid volume and blood pressure - Coronary circulation and applied physiology - Introduction to the lymphatic system: lymph, lymphatic circulation, and functions of lymph.

**References:**

1. Tortora, G & Anagnostakos, N. (1990) Principles of Anatomy and Physiology. 6th ed. USA; Harper Collins Publishers.
2. Susan Sandring. (2008) Gray's Anatomy, The Anatomical Basis of Clinical Practice. 40<sup>th</sup> Edition. Churchill Livingstone.
3. T. S. Ranganathan (1996) A Textbook of Human Anatomy 4<sup>th</sup> Edition. S. Chand
4. Chatterjee C.C (2007) Human Physiology 10<sup>th</sup> Edition. Medical Allied Agency
5. Kim E Barrett (2012) Ganong – Review of Medical physiology 24<sup>th</sup> Edition. LANGE Basic Science
6. Anatomy & physiology in Health and Illness. Ross and Willson – 11th Edition.
7. Basic Nursing Procedure Manual and Essentials. CP Thresyamma -
8. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1st Edition 2006

**PAPER II**  
**BIOCHEMISTRY - I**

**UNIT I**

**Introduction to biochemistry:** Biophysical aspects of biochemistry – TYPES OF General introduction, types of general laboratory glassware - Cleaning and care of general laboratory glassware and equipment, centrifuge, common balance, incubator and water bath, Distilled water-types of distilled water plants, preparation & storage, clinical biochemistry equipment – Photoelectric colorimeter – principal , parts and maintenance.

**UNIT II**

Unit of measurement – Grams, milligrams, millimol, meq, **Analytical balance & standard solutions:** Introduction to analytical chemistry - definition and principle of analytical balance - working and maintenance - preparation of reagents - formulation and preparation - various standard solutions used their preparation - storage of chemicals, quality control. **Acids & Bases:** Definition - pH, Buffers, Indicators, Normality, Molarity, Molality - Renal control of acid base balances - Respiratory acidosis, alkalosis and metabolic acidosis, alkalosis.

**UNIT III**

**Carbohydrates, Proteins & Lipids:** Carbohydrates: Chemical structure, function, classification, monosaccharides, disaccharides-polysaccharides, homopolysaccharides, heteropolysaccharides, glycoproteins - Proteins: Amino acids, classification, structure of protein, functions of protein, properties of proteins, denaturation, classification of proteins, antigen, antibody types of plasma proteins, Lipids: Chemical structure, functions, classification-fatty acids, triacylglycerols, phospholipids, glycoproteins, lipoproteins.

**UNIT IV**

**Vitamins, Minerals & Nucleic acids:** Fat soluble vitamins (A, D, E, and K) - water soluble vitamins - B-complex vitamins, functions of vitamin , principal elements (Calcium, phosphorus, magnesium, potassium, chlorine and sulphur) - trace elements - Nucleic acid: Definition of DNA, Types of RNA. Calorific value of foods - basal metabolic rate (BMR), respiratory quotient (RQ) specific dynamic action (SDA) - balanced diet.

**UNIT V**

**Clinical Biochemistry:** Collection and recording of biochemical specimen - separation of serum/plasma preservation and disposal of biological material - Chemical examination of urine - Qualitative, sugar, protein, bile salt, bile pigment, ketone bodies - Chemical examination of stool - occult blood - Chemical examination of other body fluids - CSF, Plural fluid, ascitic fluid - Laboratory management and maintenance of records

**References:**

1. Harper illustrated Biochemistry – Nelson and Cox 4 th ed.
2. Biochemistry and Clinical Pathology - Dr.N.Murugesh.
3. Harper illustrated Biochemistry. Nelson and Cox 4 th ed.
4. Biochemistry and Clinical Pathology. Dr.N.Murugesh.
5. Test Book of Biochemistry A.C.Deb
4. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1<sup>st</sup> Edition 2006

**PAPER III**  
**MICROBIOLOGY**

**UNIT I**

**Introduction and brief history of Microbiology:** General Introduction & terms used in Microbiology; Classification, morphology and physiology of bacteria; Historical aspect and Branches of Microbiology; Prokaryotic organisms- Prokaryote Vs Eukaryote- cell wall, structures external to cell wall, structures internal to cell wall; Eukaryotic organisms-structure of eukaryotes, characteristics of eukaryotes.

**UNIT II**

**Growth, Nutrition & Multiplication of Bacteria :** Classification of bacteria on the basis of Nutrition; Structure & definition of a bacterial cell wall; Growth requirements of microorganism- Chemical requirements, Physical requirements; Bacterial classification based on shapes; Bacterial classification based on staining methods; Classification based on Oxygen requirement (Aerobic & Anaerobic bacteria); Autotrophic & Heterotrophic bacteria;

Bacterial Classification based on environment; Growth & Multiplication of bacteria, Bacterial growth curve, Bacterial cell division, Generation time; Environmental factors affecting growth- Oxygen requirements, pH, Temperature, Carbon dioxide, Osmotic pressure.

### UNIT III

**Microscopy:** Introduction to microscopy; Purpose of microscopy; Definition of Microscope; Principles, importance & parts of Microscope; Types of Microscope.

**Sterilization and Disinfection:** Introduction to Sterilization & Disinfection; Definition of Sterilization, Disinfection; Physical & Chemical methods to destroy or reduce microbes; Physical methods- Sunlight, Drying, Heat, Filtration, Radiation; Chemical methods- Use of Alcohols, Aldehydes, Dyes, Halogens, phenols, Gases, Surface-Active agents, Metallic salts.

**Staining of bacteria:** Definition of Bacterial Staining; Principle & purpose of staining; Types of microbiological stain: Basic stains, Acidic stains, Neutral stains; Types of staining methods: Simple staining method, Differential staining method, Special staining method, Spore staining method, Capsule staining method; Principle & procedure of Gram stain & Ziehl Neelsen stain; Result interpretation and application of Gram staining & Ziehl Neelsen staining.

### UNIT IV

**Biochemical identification of bacteria:** Brief introduction to biochemical test to identify bacteria; Principle, procedure, result interpretation and application of Catalase, Oxidase, Coagulase, Indole, Citrate, Urease, Triple sugar iron.

**Bacterial culture media & culture methods:** Introduction and definition of culture media; Common ingredients of culture media; A brief note on agar; Importance of culture media; Types of culture media (solid, liquid, simple, complex, defined & semi-defined media); Types of special media.

### UNIT V

**Culture Methods:** Introduction to bacterial culture; Purpose of bacterial culture; Methods to isolate the bacteria- Streak culture, Slant culture, Stab culture, Pour plate culture, Liquid culture; Special methods of Anaerobic culture-McIntosh-Fildes anaerobic jar, Gaspac, Anaerobic chamber.

**Antibiotic Sensitivity test:** Introduction & use of antibiotic sensitivity test; Role of antibiotic sensitivity test; Components of antibiotic sensitivity test; Types of antibiotic sensitivity test (Diffusion and Dilution method of antibiotic susceptibility testing).

### References:

1. Ryan K.J and Ray C.G. Sherris, "Medical Microbiology", 4<sup>th</sup> ed. McGraw Hill.
2. Gerard J. Tortora, Berdell R. Funke, Christine L. Case, Microbiology: An Introduction, Eight Edition, Hardcover : 944 pages, Publisher: Benjamin Cummings.
3. Prescott, Harley and Klein's Microbiology 7<sup>th</sup> Ed. Author: Joanne M Wiley, Christopher J Woolverton, Linda M Sherwood.
4. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J. Ryan, C. George Ray, Hardcover : 992 pages Publisher: McGraw-Hill Medical.
5. Test Book of Microbiology . Dr.Prof.C.P.Baveja – 4<sup>th</sup> Edition
6. Medical Microbiology B.S.Nagoba – 2<sup>nd</sup> Edition
7. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1<sup>st</sup> Edition 2006

## **PRACTICAL I: BIOCHEMISTRY - I**

### **UNIT I**

Collection and processing of samples – all biochemistry investigations,  
Washing procedures and cleaning procedure of laboratory glass wares, working tables and testing rooms,  
Cleaning procedures of biochemistry equipments.

### **UNIT II**

Estimation of Blood glucose ,  
Estimation of Blood urea,  
Estimation of creatinine,  
Estimation of HBA1C.

### **UNIT III**

Estimation of total cholesterol,  
Estimation of Triglycerides,  
Estimation of Hdl, LDL, VLDL,

### **UNIT IV**

Estimation of Uric acid,  
Estimation of Bilirubin – direct , indirect,  
Estimation of total protein , albumin , globulin.

### **UNIT V**

Estimation of Sodium, potassium,  
Estimation of chloride, bicarbonate,

## **PRACTICAL II: MICROBIOLOGY**

### **UNIT I**

Collection and processing of samples – Urine, blood , sputum, CSF, throat swab, faeces, body fluids  
Sterilization  
Equipment and glass ware used in microbiology  
Microscopes – Types and uses

### **UNIT II**

Preparation of stains and reagents used in microbiology  
Preparation of different types of media

### **UNIT III**

Isolation and identification of bacteria – normal flora and pathogens  
Hanging drop, simple stains and special stains

#### **UNIT IV**

Antibiotic susceptibility testing

#### **UNIT V**

Identification of common pathogenic fungi – sample collection and special stains, culture and identification

#### **References :**

Text book of microbiology – Ananthanarayanan and Je yaram Panicker Bailey and Scott's –  
Diagnostics microbiology – Fin egole and Barbara Parasitology – K. D. Chatterjee

### **SEMESTER II PAPER IV BIOCHEMISTRY II**

#### **UNIT I**

Carbohydrate – digestion ,absorbance , metabolisms,  
Maintenance of blood glucose level – hormonal influence, Diabetes mellitus,  
Test involved in carbohydrate metabolism.

#### **UNIT II**

Protein – digestion, absorbance , metabolisms,  
Test involved in protein metabolisms,  
Lipids - digestion, absorbance , metabolisms,  
Test involved in lipid metabolisms.

#### **UNIT III :**

Enzymes and co enzymes : Enzyme definition, classification – factors affecting enzymes activity, renal function test, liver function test, renal control of acid base balance – respiratory acidosis, alkalosis, metabolic acidosis, alkalosis.

#### **UNIT IV:**

Water electrolyte and buffer systems – Sodium , potassium, chloride, bicarbonate and estimation.  
Minerals – calcium, phosphorous, iron, magnesium, copper estimation.

#### **UNIT V:**

Hormones – classification roll of biologically important hormone – Pituitary, anterior, posterior, thyroid and renal cortex, adrenal medulla – GI hormone gonadal hormones, steroid hormones,

#### **References :**

1. Harper illustrated Biochemistry – Nelson and Cox 4 th ed.
2. Biochemistry and Clinical Pathology - Dr.N.Murugesh.
3. Harper illustrated Biochemistry. Nelson and Cox 4 th ed.
4. Biochemistry and Clinical Pathology. Dr.N.Murugesh.
5. Test Book of Biochemistry A.C.Deb
6. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1<sup>st</sup> Edition 2006



## **PAPER V**

### **HAEMATOLOGY / CLINICAL PATHOLOGY / BLOOD BANKING**

#### **UNIT I**

Haematology- Automation in haematology – quality control- Haemoglobin – normal and abnormal, different types of haemoglobin- Red cells – normal and abnormal morphology, anemia – classifications and laboratory diagnosis, RBC count.

#### **UNIT II**

Haematology- Recognition and reporting of blood pictures – normal and abnormal including blood parasites Staining of blood smears – Leishman's.  
Supravital staining and reticulocyte count, iron stain, peroxidase stain, bone marrow smear staining, PCV, red cell indices, osmotic fragility, sickle cell preparation.

#### **UNIT III**

Haematology- WBC's – normal and abnormal, – benign and malignant disorders, WBC count – total and differential counts  
ESR, absolute eosinophil count, LEcell preparation, Preparation and examination of thin, thick and wet films

#### **UNIT IV**

Clinical pathology- Urine – Composition, collection and preservation, changes in composition of urine in relation to various diseases  
Complete urine analysis – physical, chemical – glucose, protein, reducing substances, ketone bodies, blood pigments, bile. Sediments

#### **UNIT V**

Clinical pathology- Body fluids, CSF and semen analysis- Parasitology – Classification and identification of common human parasites. Stool analysis

#### **References :**

1. Clinical Diagnosis by laboratory methods – Todd and Sanford
2. Practical haematology – Dacie and Lewis
3. Clinical biochemistry – Teitz
4. Practical clinical biochemistry – Harold Varley
5. Harpers illustrated biochemistry – Murray, Granner, Mayes, Rodwell
6. Practical Haematology. Dacie and Lewis
7. Harper illustrated Biochemistry. Nelson and Cox 4 th ed.
8. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1st Edition 2006

**PAPER VI**  
**HISTOPATHOLOGY AND CYTOLOGY**

**UNIT I**

Introduction to histopathological techniques  
Sample reception and record keeping  
Specimen fixation and fixatives

**UNIT II**

Processing of tissue  
Embedding

**UNIT III**

Microtomy  
Frozen section

**UNIT IV**

Mounting and staining  
Theory of H & E stain and special stains  
Stains – AFB, Fite, PAS, PASM, Masson's trichrome

**UNIT V – Cytology**

Smear preparation of FNAC  
Fixation of smears  
Pap staining  
Fluid cytology

**References :**

1. Culling – Histopathology techniques
2. Pathology - Kumar and Rabins
3. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1<sup>st</sup> Edition 2006

**PRACTICALIII: HAEMATOLOGY / CLINICAL PATHOLOGY / BLOOD BANKING**

**UNIT I – Haematology**

Estimation of haemoglobin  
RBC count  
Peripheral smear – preparation, staining, reporting  
Identification of haemoparasites

**UNIT II – Haematology**

Reticulocyte count  
Red cell indices  
PCV  
ESR  
Osmotic fertility  
Sickle cell preparation

**UNIT III – Haematology**

Total WBC count  
Differential WBC count  
Absolute eosinophil count  
LEcell preparation  
Bone marrow smear – preparation and staining  
Iron stain  
Peroxidase stain

**UNIT IV – Clinical pathology**

Urine – Sample collection  
Complete urine analysis – physical, chemical – glucose, protein, reducing substances, ketone bodies, blood pigments, bile.  
Urine sediments  
Stool analysis

**UNIT V – Clinical pathology**

Body fluid analysis  
CSF analysis  
Semen analysis

**References :**

1. Clinical Diagnosis by laboratory methods – Todd and Sanford
2. Practical haematology – Dacie and Lewis
3. Clinical biochemistry – Teitz
4. Practical clinical biochemistry – Harold Varley
5. Harpers illustrated biochemistry – Murray, Granner, Mayes, Rodwell

**PRACTICAL IV: HISTOPATHOLOGY AND CYTOLOGY**

**UNIT I**

Processing  
Fixation  
Embedding  
Microtomy

**UNIT II**

Stains – H & E  
Special stains – AFB and Fite  
Mounting of stains

**UNIT III**

Special stains – PAS, PASM and Masson's trichrome  
Demonstration of frozen section

**UNIT IV – Cytology**

Smear preparation of FNAC  
Fixation of smears

**UNIT V – Cytology**

Pap staining  
Fluid cytology

**References :**

Culling – Histopathology techniques

**Third Semester**

**PAPER VII : BIOCHEMISTRY, MICROBIOLOGY & HAEMATOLOGY**

**UNIT I – Biochemistry**

Special tests – Electrophoresis, Elisa Automation  
and quality control in the laboratory

**UNIT II – Microbiology**

Serology – Separation of sera, preservation and transport of samples for serological tests  
Basic serological reactions and techniques – Agglutination, precipitation and complement  
fixation

Separation of sera, preservation and transport of samples for serological tests  
Advanced serological techniques – Elisa

**UNIT III – Haematology**

Principles of blood coagulation  
Disorders of coagulation and haemostasis  
Platelets and disorders of platelets  
Platelet count

**UNIT IV – Haematology**

Laboratory diagnosis of bleeding and clotting disorders with quality control  
Practical aspects of one stage prothrombin time, PTT.  
Clotting time, clot retraction and clot lysis, tourniquet test.  
Demonstration – Haemoglobin electrophoresis, acid haemolysis test, Kleihauer preparation.

**UNIT V – Blood banking**

Principles of blood groups and antigen antibody reactions  
ABO – Rh blood group systems, other red cell antigens and antibodies.  
Coombs test – investigation of transfusion reaction and haemolytic disease of the newborn,  
antibody detection and titration.

**References:**

1. Clinical Diagnosis by laboratory methods – Todd and Sanford
2. Practical haematology – Dacie and Lewis
3. Clinical biochemistry – Teitz
4. Practical clinical biochemistry – Harold Varley
5. Harpers illustrated biochemistry – Murray, Granner, Mayes, Rodwell
6. Text book of medical laboratory technology – Praful Godhkar

7. Text book of microbiology – Ananthanarayanan and Je yaram Panicker
8. Bailey and Scott's – Diagnostics microbiology – Fin egole and Barbara
9. Harper illustrated Biochemistry. Nelson and Cox 4<sup>th</sup> Edition.
10. Biochemistry and Clinical Pathology. Dr.N.Murugesh.
11. Test Book of Biochemistry A.C.Deb
12. Textbook of Medical Laboratory Technology. Ramnik sood – jaypee – 1st Edition 2006
13. Test Book of Microbiology . Dr.Prof.C.P.Baveja – 4th Edition
14. Medical Microbiology B.S.Nagoba – 2nd Edition
15. Practical Haematolgy. Dacie and Lewis

### **SEMESTER III**

#### **PRACTICAL V – BIOCHEMISTRY II**

#### **UNIT I**

Estimation of renal function test – blood urea, creatinine,  
Liver function test.

#### **UNIT II**

Estimation of SGOT, SGPT, Alkaline phosphatase,  
Estimation of total Cpk,  
Estimation of amylase.

#### **UNIT III**

Estimation of sodium, potassium, chloride  
Estimation of Calcium, phosphorous,  
Estimation of ferritin, magnesium.

#### **UNIT IV**

Estimation of Thyroid hormone – total T3, T4, TSH.

#### **UNIT V**

24 hrs urine analysis - protein

## **PRACTICAL VI: MICROBIOLOGY & HAEMATOLOGY**

### **UNIT I – Haematology**

Platelet count  
Bleeding time, clotting time  
PT and PTT

### **UNIT II – Blood Banking**

Blood grouping  
Blood cross match  
Coomb's test

### **UNIT III – Biochemistry**

Demonstration of Electrophoresis and Elisa  
Revision of 1<sup>st</sup> year practicals

### **UNIT IV – Microbiology**

Demonstration of agglutination, precipitation and complement fixation tests  
Revision of 1<sup>st</sup> year practicals

### **UNIT V – Haematology / Clinical pathology / Blood banking**

Demonstration of working of blood bank  
Revision of 1<sup>st</sup> year practicals

### **References :**

1. Clinical Diagnosis by laboratory methods – Todd and Sanford
  2. Practical haematology – Dacie and Lewis
  3. Clinical biochemistry – Teitz
  4. Practical clinical biochemistry – Harold Varley
  5. Harpers illustrated biochemistry – Murray, Granner, Mayes, Rodwell
  6. Text book of medical laboratory technology – Praful Godhkar
  7. Text book of microbiology – Ananthanarayanan and Je yaram Panicker
- Bailey and Scott's – Diagnostics microbiology – Fin egole and Barbara

## **SEMESTER IV**

Internship or Project work – Viva voce

**NOTE : Practical examinations conducted in the 3<sup>Rd</sup> Semester for the following subjects will include portions covered in the 1<sup>st</sup> and 2<sup>nd</sup> Semester.**

1. **Biochemistry**
2. **Microbiology**
3. **Hematology / Clinical pathology / blood banking**