Programme Structure for B. Sc. Medical Laboratory Technology (with Minor in Food Processing Technology) (R-23)

Second Year B. Sc. Program Semester III: Teaching Scheme

Course code	Course Name	Teaching scheme			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U26PC301	Hematology	3	-	-	3	-	-	3
U26PC302	Fundamental Biochemistry	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor-II	3	-	-	3	-	-	3
UXXOE03X	Open Elective-III	2	-	-	2	-	-	2
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	2	-	-	2	-	-	2
U26PC303	Hematology Lab	-	2	-	-	1	-	1
U26PC304	Fundamental Biochemistry Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor-II Lab	-	2	-	-	1	-	1
U26VS303	Health Care and Nutrition	-	4	-	-	2	-	2
U26FP301	Blood Bank	-	4	-	-	2	-	2
U04CC0XX	Co-curricular Courses III	-	4	-	-	2	-	2
	Total	**13**	**18**	**-**	**13**	**09**	**-**	**22**

Programme Structure for B. Sc. Medical Laboratory Technology (with Minor in Food Processing Technology)
Second Year B. Sc. Program Semester III: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical Marks		Total
		Internal Assessment*				ESE *	Term work*	Practical * Oral/ POE	
		T1	T2	FET	Total				
U26PC301	Hematology	10	10	5	25	50	-	-	75
U26PC302	Fundamental Biochemistry	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor-II	10	10	5	15	35	-	-	75
UXXOE03X	Open Elective-III	10	-	5	15	35	-	-	50
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language:	10	-	5	15	35	-	-	50
U26PC303	Hematology Lab	-	-	-	-	-	25	-	25
U25PC304	Fundamental Biochemistry Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor-II Lab	-	-	-	-	-	25	-	25
U26VS303	Health Care and Nutrition	-	-	-	-	-	25	25	50
U26FP301	Blood Bank	-	-	-	-	-	25	25	50
U04CC0XX	Co-curricular Courses III	-	-	-	-	-	50	-	50

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course, AU – Audit Course

Programme Structure for B. Sc. Medical Laboratory Technology (with Minor in Food Processing Technology)
Second Year B. Sc. Program Semester IV: Teaching Scheme

Course Code	Course Name	Teaching scheme			Credits assigned			Total credits
		Th	Pr	Tu	Th	Pr	Tu	
U26PC401	Immunology and Serology	3	-	-	3	-	-	3
U26PC402	Clinical Biochemistry	3	-	-	3	-	-	3
U26PC403	Immunology	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor-III	3	-	-	3	-	-	3
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	2	-	-	2	-	-	2
UXXOE04X	Open Elective-IV	2	-	-	2	-	-	2
U26PC404	Immunology and Serology Lab	-	2	-	-	1	-	1
U26PC405	Clinical Biochemistry Lab	-	2	-	-	1	-	1
UXXMM0XX	Multidisciplinary Minor-III Lab	-	2	-	-	1	-	1
U26SE403	Hospital Management	-	4	-	-	2	-	2
U04CC0XX	Co-curricular Courses IV	-	4	-	-	2	-	2
U03VE40X	Universal Human Values-II	-	-	-	-	-	-	Audit Course
	Total	**15**	**14**	**-**	**15**	**07**	**-**	**22**

Programme Structure for B. Sc. Medical Laboratory Technology (with Minor in Food Processing Technology)
Second Year B. Sc. Program Semester IV: Evaluation Scheme

Course Code	Course Name	Theory Marks					Practical Marks		Total
		Internal Assessment*				ESE*	Term work *	Practical * Oral/ POE	
		T1	T2	FET	Total				
U26PC401	Immunology and Serology	10	10	5	25	50	-	-	75
U26PC402	Clinical Biochemistry	10	10	5	25	50	-	-	75
U26PC403	Immunology	10	-	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor-III	10	10	5	25	50	-	-	75
U03AE003 U03AE004 U03AE005	Modern Indian Language: Hindi OR Modern Indian Language: Sanskrit OR Modern Indian Language: Marathi	10	-	5	15	35	-	-	50
UXXOE04X	Open Elective-IV	10	-	5	15	35	-	-	50
U26PC404	Immunology and Serology Lab	-	-	-	-	-	25	-	25
U26PC405	Clinical Biochemistry Lab	-	-	-	-	-	25	-	25
UXXMM0XX	Multidisciplinary Minor-III Lab	-	-	-	-	-	25	-	25
U26SE403	Hospital Management	-	-	-	-	-	25	25	50
U04CC0XX	Co-curricular Courses IV	-	-	-	-	-	50	-	50
U03VE40X	Universal Human Values-II	-	-	-	-	-	-	-	Audit Cours

* Minimum passing is 40% for all courses and evaluation head mentioned above. FET – Faculty evaluation for Theory, T1, T2, Continuous Assessment Test, Term Work , ESE - End Semester Examination, P/F – Pass/ Fail Course

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26PC301	Hematology	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U26PC301	Hematology	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of hematology, imparting knowledge about the fundamentals of blood science, sources and basic components of blood classification and their uses.

Course Objectives:

1. To understand the basic principles of blood.
2. To study the different constituents of blood.

Course Outcomes: after the end of this course students will able to

CO1 Estimate[1]The scope and historic background of blood .

CO2 Identify[2] Various source of blood.

CO3 Describe[3] Types of blood products and their composition

CO4 Analyze[2] Basic concepts of blood.

Course Contents

Module	Description	Hours
1	RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3- BPG and oxygen dissociation curve. Anemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test. Megaloblastic anemia, pernicious anemia, pathogenesis, laboratory investigations.	9
2	Hemoglobin, its synthesis and types, normal and abnormal hemoglobin, extra vascular and intravascular hemolysis. Hemolytic anemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD.	9
3	Leukopoiesis , Stages of Leukocyte Maturation, Features of Cell Identification, leucocytosis and leucocytopenia , neutrophilia , eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on blood cell parameter	9
4	Overview of homeostasis and coagulation, Stages of platelets development, Primary and Secondary homeostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis.	9
5	General blood picture, Estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin,Vit.B12, Folic acid, FIGLU test, Schiling test, Parietal cell antibodies,G-6-PD, Osmotic fragility test, Heinz bodies, Perls Prussian staining, Platelet count, Platelet aggregation test, PT, INR APTT, Mixing experiments in PT and APTT, Thrombin time.	9

Reference Books

1. L. K. Mukherjee (2017), Medical Laboratory Technology,V 1-3,3rd edition, Tata Mcgraw Hill

2. Sood Ramnik (2015), Text book of Medical Laboratory Technology, 2nd edition, Jaypee Publications

3. Wintrobe's Clinical Haematology (2014), 13th edition, Lippincott Williams & Wilkins

4. De Gruchy's Clinical Haematology in Medical Practice,(2012), 6th edition, Wiley Publications

5. Dacie & Lewis Practical Haematology, (2011),11th edition, Elsevier Publications

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26PC302	Fundamental Biochemistry	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U26PC 302	Fundamental Biochemistry	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of biochemistry, imparting knowledge about the fundamentals of biological and chemical science, sources and basic components of biological facts and classification with their uses.

Course Objectives:

1. To understand the basic principles of biochemistry.
2. To study the different constituents of biochemistry.

Course Outcomes: after the end of this course students will able to

CO1 Estimate[1]The scope and historic background of biochemistry. .

CO2 Identify[2] Various source.

CO3 Describe[3] Types of products and byproducts with their composition

CO4 Analyze[2] Basic concepts of biochemistry.

Course Contents

Module	Description	Hours
1	Basic concept of Acids, Bases, Salts and Indicators Acid, base, salts and buffers Indicators and their Functions Buffers of the body.	9
2	Conventional and SI units used in the Laboratory Molecular and equivalent weight Normality, molality, molarity Concentrations of solutions by w/w, w/v, v/v etc. Preparation of standard solutions Molar solutions and Percent solutions.	9
3	Dilutions of Solutions or Samples: Preparation of a stock standard and working standard. Proper method of dilution of a solution or a laboratory sample. Serial dilutions of samples Saturated and supersaturated solutions Significance of volumetric flask in preparing standard solutions.	9
4	Introduction to biomolecules. Carbohydrates, and Proteins, their structure and functions Chemistry of carbohydrates: Introduction, Basic Classification; Reducing & Nonreducing Sugars; Osazone formation; digestion & absorption of carbohydrates; Proteins and Amino acids: Amino acids: Definition & classification; Essential & non essentials amino acids; Proteins: Classification, General characteristics, Basic structure; Digestion & absorption of proteins.	9
5	Lipid & their metabolism: General introduction; Basic classification Simple & Compound lipids; Essential fatty acids: Physiological functions & deficiency; Biological membrane; Properties of Lipid aggregates (elementary idea). Digestion & absorption of lipids.	9

Reference Books

1. R. L Madan (2014). Textbook of Chemistry S Chand and company pvt, ltd., New Delhi

2. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.

3. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd edition., Wiley.

4. Douglas, B.E., McDaniel, Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.

5. Text book of medical laboratory technology; by Dr. P. B. Godkar

6. Harper's Biochemistry

7. Biochemistry by U. Satyanarayana

Lab course Without POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U26PC303	Hematology Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
		Term Work	Min pass %	Marks	Min pass %	Total (Marks)
U26PC303	Hematology Lab	25	40			25

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[3] general chemical techniques to measure quality

CO2 **Demonstrate**[2] the making different solution / solvents.

CO3 **Apply**[3] Chemical methods to estimate the different elements of blood.

List of Practical's

1. Recognizing & reporting of blood pictures, normal & abnormal
2. Methods of measuring haemoglobin
3. Total RBC, WBC, platelet count
4. Absolute eosinophil count
5. Recognition of blood parasites
6. Packed cell volume.
7. Determination of fetal hemoglobin
8. Osmotic fragility test.
9. LE cell phenomenon
10. Heinz body preparation.

Lab course Without POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26PC304	Fundamental Biochemistry Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U26PC304	Fundamental Biochemistry Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40			25

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[3] general chemical techniques to measure quality

CO2 **Demonstrate**[2] the making different solution / solvents.

CO3 **Apply**[3] Chemical methods to estimate the different elements.

List of Practicals

1. Determination of normality of 10 % sodium hydroxide and learning pipetting and dispensing techniques.
2. Standardization of 1.0 ml volumetric pipette and learning use, care and maintenance of various balances.
3. Preparation of primary normal solution (1.0 N sodium carbonate).
4. Preparation of normal solutions (1.0 N hydrochloric acid, 1.0 N sodium hydroxide and 2/3 N sulphuric acid)
5. Preparation of percent solution (V/V): 2% (V/V) acetic acid (WBC diluting fluid)

6. Preparation of molar solutions (M/15 Sodium phosphate solutions) for the preparation of a buffer solution: phosphate buffer (M/15, PH 7.45) Learning use, care and maintenance of a pH meter
7. General qualitative test for carbohydrates
8. General qualitative test for proteins
9. General qualitative test for lipids
10. Biochemical analysis of blood and urine
11. Abnormal constituents of urine

- Evaluation Scheme

1. Term work assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and Term work assessment should be done.
4. OE/POE shall be based on all Term work and work carried out during semester.

Lab course With POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26VS303	Health Care and Nutrition	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U26VS303	Health Care and Nutrition	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[3] general techniques to measure health quality

CO2 **Demonstrate**[2] the different nutrition charts

CO3 **Apply**[3] different methods for healthy and nutritious lifestyle

List of Practicals

1. Bed Side Management: Giving and taking Bed pan,
2. Urinal : Observation of stools, urine.
3. Observation of sputum,
4. Understand use and care of catheters
5. Understand use and care of enema giving.
6. Methods of Giving Nourishment: Feeding, Tube feeding, drips,
7. transfusion Care of Rubber Goods
8. Recording of body temperature, respiration and pulse
9. Demo of BMR
10. Demo of Diet Chart

Lab course With POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26FP301	Blood Bank (Field Project)	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U26FP301	Blood Bank (Field Project)	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40	25	40	50

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[3] general techniques in blood banking

CO2 **Demonstrate**[2] the different disease and disorders

CO3 **Apply**[3] different methods for collection and handling of blood

Objectives of Field project-Blood Banking

1. Collection and Handling of Blood- Standardize procedure, phlebotomy tray, Blood film preparation,
differences between capillary and venous blood, Anticoagulant used
2. Storage of blood and its transportation, effects of storage on Blood count and Blood morphology.
3. Principle of Blood grouping, false positive and false negative reaction. Coomb's test/ Du test
4. Blood component separation- principles , preparation & uses
5. Laboratory aspects of Blood Transfusion in total or in fractionated components, Cross matching

6. Mandatory blood tests in blood banking with donor's blood.

7. Apharesis: An overview

8. Disorders of mismatched blood transfusion , General idea about Blood Transfusion related diseases

9. Wastage of blood units- possibilities.

10. Introduction to Automation in haematology- Principle , advantages, cautions,

11. Classification & lab diagnosis of Leukemias

12. Leukaemia vs leukemoid reaction.

13. Cytochemical stains for Differential diagnosis of leukemia

14. Flow cytometry

15. Basic concepts of Haemorrhagic disorders.

16. Basic concepts of coagulation disorders.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U26PC401	Immunology and Serology	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U26PC401	Immunology and Serology	10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of Immunology and Serology, imparting knowledge about the fundamentals of Immunology and Serology, sources and basic components of blood system classification and their uses.

Course Objectives:

1. To understand the basic principles of Immunology
2. To study the different constituents of Serology.

Course Outcomes: after the end of this course students will able to

CO1 Estimate[1]The scope and historic background of Immunology and Serology

CO2 Identify[2] Various source of Serology.

CO3 Describe[3] Types of Immunology and their relation to Serology.

CO4 Analyze[2] Basic concepts of Serology.

Course Contents

Module	Description	Hours
1	Introduction to Immunology, Antigens: Properties and types of antigens, types of antigens; Biological classes of antigens; Various determinants of antigenicity. Antigen presenting cells, antigen processing and presentation.	9
2	Complement system and complement fixation test. Immune based therapies: vaccines, monoclonal and therapeutic antibodies.	9
3	Laboratory tests for demonstration of antigen: antibody reaction such as agglutination, precipitation, Enzyme Linked Immunisorbant Assay (ELISA), RIA, Immunofluorescence, Rheumatological diseases, etiology and pathogenesis and lab investigations.	9
4	Structure and function of immunoglobulins/antibodies: general functions of immunoglobulins, structure of immunoglobulins and different types of immunoglobulins; Brief aspects of abnormal immunoglobulins.	9
5	Introduction to Serology, Common serological tests – ELISA, WIDAL, VDRL, ASLO, CRP, RF, HIV (Rapid test), HBsAG (Rapid test); General features of antigen-antibody reactions – precipitation reactions, agglutinations, complements fixation test, neutralization, opsonization, radioimmunoassay (RIA) test, and immunofluorescence (IF) test.	9

Reference Books:

1. Text Book of Medical Laboratory Technology 5th edition – RamnikSood.

2. Text Book of Biochemistry for Medical Students 5th edition – DM Vasudevan.

3. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia. Page 27 of 38.

4. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley- Blackwell Scientific Publication, Oxford.

3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.

5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.

6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

7. Textbook of Medical Laboratory Technology- PrafulB.Godkar, Darshan P. Godkar

8. Medical Laboratory Technology. Methods and Interpretations – RamnikSood (volume 1&2)

9. Medical Laboratory technology a procedure manual for routine diagnostic test - vol - I, II, III. Kanai L. Mukharjee Tata Mc graw hill pub. New Delhi.

- Evaluation Scheme

  Internal Assessment (T1, T2 and FET):

  1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  2. Fifth module will be assessed for 5 marks separately it will be taken as seminar.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U26PC402	Clinical Biochemistry	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
U26PC402	Clinical Biochemistry	10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of Clinical Biochemistry, imparting knowledge about the fundamentals of co-relation between clinic and biochemicals. Biochemical sources and basic components of blood system classification and their uses.

Course Objectives:

1. To understand the basic principles of Clinical Biochemistry
2. To study the different constituents of Clinical Biochemistry.

Course Outcomes: after the end of this course students will able to

CO1 Estimate[1]The scope and historic background of Clinical Biochemistry

CO2 Identify[2] Various source.

CO3 Describe[3] Types of clinic and their relation to biochemical compound estimations.

CO4 Analyze[2] Basic concepts in Clinical Biochemistry

Course Contents

Module	Description	Hours
1	Chemistry of carbohydrates: Carbohydrates, Definition, Important functions, Classification, Properties of carbohydrates, Isomerism, Epimers, Digestion of carbohydrates, Absorption of carbohydrates, Metabolism of carbohydrates, general metabolism, Glycolysis, glycogenesis, HMS pathway, Gluconeogenesis and Lipogenesis, the Cori cycle, formation of Ketone bodies, Role of hormones, deranged glucose metabolism.	9
2	Detection of diabetes, types of diabetic, criteria for diagnosis of diabetis, Diabetic profile tests, hypoglycemia, diabetes self-testing, Importance of determination of Insulin, pro-insulin and C-peptide assays, Determination of urinary, plasma and other body fluid glucose, various methods, merits, demerits, clinical significance, use of semi-automated method for determination of plasma glucose, importance of determination of micro-albuminurea and glycosylated hemoglobin.	9
3	Chemical tests in kidney disease: General consideration, Urea metabolism, Creatine- metabolism, Lohmann reaction, Importance of nucleic acids, nucleotide, nucleotides bases, formation of nucleoside and nucleotide, Structure of DNA, Structure of RNA, denaturation of DNA, nucleoproteins and Uric acid metabolism, various Laboratory tests for the determination of blood/Plasma/ Serum ,urea, creatinine & uric acid.	9
4	Chemistry of proteins: Definition, importance, structure of proteins, classification of proteins, amino acids present in proteins, Important properties of proteins and amino acids, Structure-function relationship of proteins, various types of proteins, plasma proteins, function of plasma proteins, Amino acid metabolism, body's amino acid pool sources and utilization, disorder affecting amino acid metabolism, Laboratory	9

	methods for the determination of amino acids and proteins in serum and other body fluids and clinical significance of respective tests.	
5	Enzymes: Introduction, enzymes as catalysts, enzyme specificity, enzyme catalysis, the nature of enzyme catalysis, active site of enzymes, factors which affect enzyme activity, enzyme classification and nomenclature, enzyme- end point reaction methods, clinical significance, units for measuring enzyme activity, laboratory tests for the determination of SGPT, SGOT, alkaline and acid phosphatases, amylase and LDH. Clinical significance of each test (as mentioned above).	9

Reference Books

3. R. L Madan (2014). Textbook of Chemistry S Chand and company pvt, ltd., New Delhi

2. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.

3. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd edition., Wiley.

4. Douglas, B.E., McDaniel, Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.

5. Text book of medical laboratory technology; by Dr. P. B. Godkar

6. Harper's Biochemistry

7. Biochemistry by U. Satyanarayana

- Evaluation Scheme

  Internal Assessment (T1, T2 and FET):

  3. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  4. Fifth module will be assessed for 5 marks separately it will be taken as seminar.

Theory Course

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26PC403	Immunology	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
U26PC403	Immunology	T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
		10	10	5	25	40%	50	40%	75

Course Description: This course will focus on and explore the ideas from viewpoint of knowing and understanding the basics of Immunology, imparting knowledge about the fundamentals of Immuno System, sources and basic components of Immuno system classification and their uses.

Course Objectives:

3. To understand the basic principles of Immunology
4. To study the different constituents of Immunology.

Course Outcomes: after the end of this course students will able to

CO1 Estimate[1]The scope and historic background of Immunology

CO2 Identify[2] Various source of Immunology.

CO3 Describe[3] Types of Immunology and their relation.

CO4 Analyze[2] Basic concepts of Immunology.

Course Contents

Module	Description	Hours
1	Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response. Cell and organs of immune system, Phagocytosis.	9
2	Immune System: Host defence against infection : infectious agents, host defence, and immune recognition; Structure and function of immune system, organs of immune system, cells of immune system, function of immune system; Immunity and Immune Response, cellular basis of immunity, molecular basis of immunity, immune response and disease;	9
3	Production and function of B cells during bacterial infections: Production of B cells, activation of B cells; Production and function of T cells during bacterial infections, types of cells, production of T cells, activation of T cells.	9
4	Antigens and haptens : Properties ,foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens. Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype	9
5	Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody, Mechanism of humoral and cell mediated immune response. Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans.	9

Reference Books:

1. Text Book of Medical Laboratory Technology 5th edition – RamnikSood.

2. Text Book of Biochemistry for Medical Students 5th edition – DM Vasudevan.

3. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia. Page 27 of 38.

4. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley- Blackwell Scientific Publication, Oxford.

3. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.

5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.

6. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.

7. Textbook of Medical Laboratory Technology- PrafulB.Godkar, Darshan P. Godkar

8. Medical Laboratory Technology. Methods and Interpretations – RamnikSood (volume 1&2)

- Evaluation Scheme

  Internal Assessment (T1, T2 and FET):

  5. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
  6. Fifth module will be assessed for 5 marks separately it will be taken as seminar.

Lab course Without POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U26PC404	Immunology and Serology Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
		Term Work	Min pass %	Marks	Min pass %	Total (Marks)
U26PC404	Immunology and Serology Lab	25	40			25

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[1] general techniques to measure health quality

CO2 **Demonstrate**[2] the different patients diagnostic charts

CO3 **Apply**[3] different methods for treating patients

List of Practicals

1. Blood collection & preservation using different anticoagulants & preservative solutions.
2. Component preparation
3. ABO grouping
4. Rh typing
5. Antibody direction & titration
6. Coombs test
7. Compatibility testing- cross matches
8. Investigation of transfusion reactions
9. Investigation of hemolytic disease of new born
10. HBsAg & HIV antibody testing in blood bank
11. Diagnosis of viral infections- isolation& serological test

Lab course Without POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
U26PC405	Clinical Biochemistry Lab	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
U26PC405	Clinical Biochemistry Lab	Term Work	Min pass %	Marks	Min pass %	Total (Marks)
		25	40			25

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[1] general techniques to measure health quality

CO2 **Demonstrate**[2] the different patients diagnostic charts

CO3 **Apply**[3] different methods for treating patients

List of Practicals

1. Introduction to the Clinical Biochemistry laboratory, responsibilities and safety measures.

2. Preparation of protein free filtrate, separation of serum and plasma from appropriate blood and Learning use, care and maintenance of a centrifuge.

3. Preparation of anticoagulated bulbs and use, care and maintenance of hot air oven water bath and incubator.

4. Preparation of a complex reagent (e.g. Benedict's qualitative reagent) and learning use, care and maintenance of hot plate and magnetic stirrer.

5. Learning operation and care and maintenance of a spectrophotometer

6. Multi-step quantitative method (Folin-wu's method)

7. Learning a mono-step method (GOD/POD)

Lab course With POE

Course code	Course name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
U26SE403	Hospital Management	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
		Term Work	Min pass %	Marks	Min pass %	Total (Marks)
U26SE403	Hospital Management	25	40	25	40	50

Course Outcomes: after the end of this course students will able to

CO1 **Analyze**[1] general techniques to measure health quality

CO2 **Demonstrate**[2] the different patients diagnostic charts

CO3 **Apply**[3] different methods for treating patients

List of Practicals

1. Bed Side Management: Giving and taking Bed pan,
2. Urinal : Observation of stools, urine.
3. Observation of sputum,
4. Understand use and care of catheters
5. Understand use and care of enema giving.
6. Methods of Giving Nourishment: Feeding, Tube feeding, drips,
7. Transfusion Care of Rubber Goods
8. Recording of body temperature, respiration and pulse