Course Code	Course Title	Course ID	L	T	P	Credits	TE	TI	PE	PI	Total
Discipline Specific Courses (DSC)											
240/BMLS/CC/201	General anatomy-II – Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/202	General Physiology-II – Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/203	General Clinical Microbiology-Theory		2	1	-	3	50	25	-	-	75
240/BMLS/CC/204	Basic Hematology & Clinical Pathology- Theory		2	1	-	3	50	25	-	-	75
240/BMLS/CC/205	General anatomy-II – Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/206	General Physiology-II – Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/207	General Clinical Microbiology-Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/208	Basic Hematology & Clinical Pathology-Practical		-	-	4	2	-	-	35	15	50
Minor (MIC) / Vocational Courses (VOC)											
240/BMLS/MI/201	Extracurricular Activity		2	-	-	2	35	15	-	-	50
Multidisciplinary courses(MDC)											
240/BMLS/MD/201	Yoga		2	-	-	2	35	15	-	-	50
Ability Enhancement Course (AEC)											
240/BMLS/AE/201	Personality Development & Soft Skills		2	-	-	2	35	15	-	-	50
Skill Enhancement Course (SEC)/ Internship/Dissertation											
240/BMLS/SE/201	Basic in Computer & Information Sciences- Practical.		-	-	4	2	-	-	35	15	50
Total Credits						**28**	**Total Marks**			**700**	

Ms. Kalpana Banjoshi Bist

Mr. Pramod Kumar

Md. Imtiyaz Ansari

Dr. Garima Srivastava

Dr. Himanshu Thapral

4th SEM BMLS

Course Code	Course Title	Course ID	L	T	P	Credits	TE	TI	PE	PI	Total
Discipline Specific Courses (DSC)											
240/BMLS/CC/401	Applied Bacteriology-Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/402	Analytical Clinical Biochemistry- Theory		2	1	-	3	50	25	-	-	75
240/BMLS/CC/403	Applied Histopathology-Theory		2	1	-	3	50	25	-	-	75
240/BMLS/CC/404	Applied Clinical Biochemistry- I-Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/405	Applied Haematology-Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/406	Applied Bacteriology-Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/407	Applied Haematology-Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/408	Analytical Clinical Biochemistry-Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/409	Applied Histopathology–Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/410	Applied Clinical Biochemistry- I-Practical		-	-	4	2	-	-	35	15	50
Minor (MIC) / Vocational Courses (VOC)											
240/BMLS/MI/401	Environmental Science- Theory		-	-	4	2	35	15	-	-	50
Skill Enhancement Course (SEC)/ Internship/Dissertation											
240/BMLS/SE/401	Lab Visit		-	-	4	2	-	-	35	15	50
Total Credits						**29**	**Total Marks**			**725**	

6TH SEM BMLS

Course Code	Course Title	Course ID	L	T	P	Credits	TE	TI	PE	PI	Total
Discipline Specific Courses (DSC)											
240/BMLS/CC/601	Cytopathology-Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/602	Medical Virology & Mycology-Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/603	Blood Banking & Genetics-Theory		2	1	-	3	50	25	-	-	75
240/BMLS/CC/604	Research methodology and Biostatistics-Theory		3	-	-	3	50	25	-	-	75
240/BMLS/CC/605	Cytopathology-Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/606	Medical Virology & Mycology-Practical		-	-	4	2	-	-	35	15	50
240/BMLS/CC/607	Blood Banking & Genetics-Practical		-	-	4	2	-	-	35	15	50
Minor (MIC) / Vocational Courses (VOC)											
240/BMLS/MI/601	Work Shop		-	1	-	1	20	5	-	-	25
Skill Enhancement Course (SEC)/ Internship/Dissertation											
240/BMLS/SE/601	Project Work- Practical				100	4	-	-	75	25	100
Total Credits						**23**	**Total Marks**			**800**	

SECONDSEMESTER Syllabus

Course Title : General Anatomy-II- Theory	
Semester : II | Course code: BMLS201T	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Course Outcome-

The students are supposed to have basic knowledge of structure of human body, its anatomical parts and physiological functions

Course contents

Unit-1 Classification of nervous system

Nerve- structure, classification, microscopy with examples. Neurons, classification with example Simple reflexes.

Parts of a typical spinal nerve/Dermatome: Central nervous system -disposition, parts and functions Cerebrum, Cerebellum, Midbrain & brain stem Blood supply & anatomy of brain.

Unit 2

Spinal cord-anatomy, blood supply, nerve pathways Pyramidal, extra pyramidal system, Thalamus, hypothalamus, Structure and features of meninges Ventricles of brain, CSF circulation Development of nervous system & defects.

Unit -3 Cranial nerves -(course, distribution, functions and palsy) Sympathetic nervous system, its parts and components Para sympathetic nervous system Applied anatomy

Unit -4 Structure and function of Visual system, auditory system, Gustatory system, Olfactory system, Somatic sensory system. Pelvic floor, innervations Kidney, Ureter, bladder, urethra. Reproductive system of male, Reproductive system of female.

Reference books:

- Sampath Madhyastha's Manipal manual of anatomy for allied health sciences
- Krishna Garg & Madhu Joshi's Practical anatomy work book
- Dixit's Atlas of Histology for Medical Students
- Basic Histology: A Color Atlas & Text
- Jana's Exam Oriented Practical Anatomy
- Krishna's Anatomy Mnemonics

Course Title: GENERAL PHYSIOLOGY-II- Theory			
Semester : II	Coursecode:	Credits:03	Core
No of sessions Lectures/ Tutorial:30		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Course outcome-

The students are supposed to have basic knowledge of structure of human body, its anatomical parts and physiological functions.

Course contents-

Unit -1 Physiologyofkidneyandurineformation Glomerularfiltrationrate,clearance, Tubular function, Ureter, bladder, urethra

Unit-2-Physiologyoftheendocrineglands-Hormonessecretedbytheseglands, their Classifications and
function

Unit-3- Male- Functions of testes, pubertal changes in males, testosterone-action& regulations of secretion.

Unit 4 Female-Functions of ovaries and uterus, pubertal changes, menstrual cycle, estrogen and progesterone -action and regulation.

Reference Books:

1. C C Chatterjee's Human Physiology
2. C C Chatterjee's Practical Physiology for Paramedical Courses
3. CNChandra shekhar's Manipal Manual of Medical Physiology
4. R K Maurya's Medical Physiology

Course Title: General Clinical Microbiology- Theory	
Semester : II | Course code:	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: This subject gives a general insight into the history and basics of medical microbiology, imparts knowledge about equipment used in Medical Microbiology and basic procedures done in a medical microbiology laboratory i.e. microscopy, sterilization, disinfection, culture methods required to perform different microbiological tests in clinical microbiology lab and biomedical waste management.

Course outcome-The candidates undergoing training in medical laboratory technology will learn the techniques of collection of samples, their processing and identification of various pathogens like bacteria, parasites, viruses using different techniques. In addition, the candidates are given training in the use of standard safety measures while handling infective materials. The basic knowledge of different diseases caused by various micro-organisms is also imparted.

Unit-1: Introduction to Medical Microbiology:

1. Definition, History, Host-Microbe relationship
2. Glassware Used in Microbiology-Introduction, Care and handling of glassware, cleaning of glassware.
3. Equipment used in clinical Microbiology Laboratory: Introduction, Care and maintenance including calibration.
4. Microscopy: Introduction and history, Types, principle and operation mechanism of following microscopes-

   Light microscope, DGI, Fluorescent, Phase contrast, Electron microscope: Transmission/ Scanning

Unit-2: Sterilization:

1. Definition, Types and principles of sterilization methods
2. Heat (dry heat, moist heat with special Reference to autoclave)
3. Radiation, Filtration
4. Efficiency testing to various sterilizers
5. Qualitycontrolinculturemedia,Automationinculturemediapreparation
6. Aerobic&anaerobicculturemethods:Concepts,MethodsUsedforaerobiccultures,Methods used for anaerobic cultures

Unit-3: Antiseptics and Disinfectants:

1. Definition, Types and properties.
2. Mode of action-Uses of various disinfectants
3. Precautions while using the disinfectants- Qualities of a good disinfectant
4. Testing efficiency of various disinfectants
5. Types of the waste generated-Segregation-Treatment-Disposal

Unit-4: General characteristics & classification of Microbes & Nutrition:

1. Classificationofmicrobeswithspecialreferencetoprokaryotes&eukaryotes
2. Morphological classification of bacteria, Bacterial anatomy (Bacterial cell structures).
3. General nutritional & other requirements of the bacteria
4. Classificationofbacteriaonthebasisoftheirnutritionalrequirements

1. Culture media: Introduction
2. Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media, routine/synthetic/definedmedia,basalmedia,enriched,enrichment,Selective differential media, sugar fermentation media, transport media, preservation media and anaerobic culture media

Reference Book:

1. Practical Medical Microbiology by Mackie and McCartney
2. Textbook of Microbiology by Ananthanarayan
3. Medical Microbiology by Panikar & Satish Gupte
4. Medical laboratory Technology vol .I, II, III by Mukherjee
5. DistrictLaboratoryPracticeintropicalcountriesVolIIIMicrobiologybyMonicaCheesbrough
6. Textbook of Microbiology by Prescott

Course Title : Basic Hematology & Clinical Pathology- Theory			
Semester : II	Course code: I	Credits:03	Core
No of sessions Lectures/Tutorial:30		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: Students will be made aware of the composition of blood and methods of estimating different components of blood. Students will learn the basic concepts of Haematology & routine clinical investigations of Haematology laboratory.

Course outcome- in this subject is imparted to enable the students to carry out routine clinical laboratory investigation (blood, urine etc.). They should be able to provide technical help for selected sophisticated hematological techniques with adequate knowledge of various principles

Unit-1: Introduction to Haematology:

1. Definition, Importance equipment used.
2. Laboratory organization and safety measures in Haematology Laboratory
3. Introductiontoblood,itscomposition,functionandnormalcellularcomponents
4. Anticoagulants : types, mode of action and preference of anticoagulants for different hematological studies

Unit-2:

1. Collectionandpreservationofbloodsampleforvarioushematologicalinvestigations
2. Formation of cellular components of blood (Haemopoiesis), Erythropoiesis, Leucopoiesis, Thrombopoiesis.
3. Hemoglobin: definition, types, structure, synthesis and degradation
4. Morphology of normal blood cells
5. Collection, transport and preservation of clinical specimens other than blood; Processing of various clinical Specimens; CSF examination in clinical practice
6. –Semen analysis in clinical practice; Sputum examination as relevant to Pathology lab; Stool examination as relevant to Pathology lab

Unit- 3:

-Normal Hemostasis & physiological properties of coagulation factors.
-Quality assurance in Haematology
-Internal and external quality control including reference preparation
-Routine quality assurance protocol
-Statistical analysis. e., Standard deviation, Co-efficient of variation, accuracy and precision

Unit-4:

1. Preparation of thin and thick smears and its uses; staining of blood smears;
2. Differential leucocytes count by manual and automated method; Physiological and pathological variations in leukocyte values;
3. Theory of erythrocyte sedimentation rate; Measurement of ESR -manual and automated method; Hematocrit and red cell indices Its use in clinical practice; Principle of automated blood cell counter.
4. Reticulocyte count

   -Approach to a patient with bleeding disorder; Bleeding time, clotting time, Platelet count
   -Prothrombin time, Prothrombin concentration, INR; Clot retraction test and APTT

Reference Book:

1. Textbook of Medical Laboratory Technology by Praful B. Godkar
2. Medical laboratory Technology by K. L. Mukherjee Volume-I
3. Practical Hematology by J. B. Dacie

PRACTICALS

Course Title : General Anatomy-II- Practical	
Semester :II Course code:	Credits:02
Number of sessions: 40	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

ANATOMYPRACTICAL

1) Identification and description of all anatomical structures.

2) Demonstration of dissected parts

3) Demonstration of skeleton-articulated and disarticulated.

4) Surface anatomy: Surface landmark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

Reference books:

- Sampath Madhyastha's Manipal of anatomy for allied health sciences
- Krishna Garg & Madhu Joshi's Practical anatomy work book
- Jana's Exam Oriented Practical Anatomy

Course Title: GENERAL PHYSIOLOGY-II- Practical	
Semester :II I Course code:	Credits:02 I Core
Number of sessions: 40	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

PRACTICAL:

1. To study circulatory system from charts and transverse section (TS) of artery and vein from permanent slides.
2. To study digestive system from chart sand T S of liver, spleen and pancreas from permanent slides.
3. Study of Urinary system(charts)
4. Study of Genital system (male & female) from charts and TS of testis and ovary from permanent slides.
5. To study nervous system (From models /charts)
6. To study various body fluids.
7. Other practical based on the theory paper.

Course Title : General Clinical Microbiology- Practical	
Semester : II I Course code:	Credits:02 I Core
Number of sessions: 40	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

PRACTICAL

1. To demonstrate safe code of practice for a Microbiology laboratory
2. To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
3. To demonstrate the working & handling of Compound microscope.
4. To demonstrate the method of sterilization by autoclave including its efficacy testing.
5. To demonstrate the method of sterilization by hot air oven including its efficacy testing.
6. Todemonstratethemethodofsterilizationofmedia/solutionbyfiltration.
7. Demonstration of Antiseptics, Spirit, Cetrimide & Povidone- Iodine.
8. To demonstrate the use of disinfectants.
9. Demonstrate the precaution while using disinfectants.
10. To prepare working dilution of commonly used disinfectants.
11. To demonstrate the different morphological types of bacteria
12. Preparation of one culture media from each type
13. To demonstrate aerobic culture
14. To demonstrate anaerobic culture

Course Title: Basic Haematology& Clinical Pathology- Practical			
Semester: II	Course code: I	Credits:02	Core
Number of sessions: 40		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

Practical:

1. Preparation of various anticoagulants:
   1.1 EDTA
   1.2 Sodium Citrate
   1.3 Oxalate with Fluoride
2. Collection of blood sample for various Lab Investigations
3. Familiarization and working of routine Haematology Lab.
4. Instruments

4.1Microscopes

4.2 Haemocytometers
4.3 Colorimeter
4.4 Spectrophotometer
4.5 Glass pipettes & Auto pipettes
4.6 Glassware
4.7 Sahli's Apparatus
-Identification of Normal blood cells
-Urine Analysis:
-Routine biochemistry of Urine for: Physical Examination

-Biochemical Examination Microscopic Examination of Urine

Course Title: Basic in Computer & Information Science- Practical	
Semester : I I Course code:	Credits:02 I Core
Number of sessions: 20	Total Marks: 70

1. Introduction to computer: Introduction, characteristics of computer, computer languages.
2. Input output devices
3. Central Processing Unit
4. Storage Device
5. Operation with Window
6. Introduction to MS-Word: introduction, components of a word window, creating, opening
7. and inserting files, editing a document file, page setting and formatting the text, spell
8. Checking, printing the document file, creating and editing of table, mail merge.
9. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
10. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Course Title: Personality development & Soft skills- Theory	
Semester :II I Course code :	Credits:02 I Core
No of sessions Lectures/Tutorial:20	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Objective: Basic Manners, Social Etiquette, Behaviour, Relations and professional Grooming are required for all the students to be complete in their life skills.

Outcome: The students should be able to emit the correct Personal and professional Behaviour at all times.

Skills Imparted: Personal, Professional, Interpersonal and Life Skills

SYLLABUS

Unit 1

Introduction on Life Skills.
Definition Intel personal Skills
Expectation Audit
Uses and Application

Unit 2

Personal Grooming
Personal Hygiene
Dress Up
Left Brain / Right Brain

Unit 3

Personal Relation
Family Values

Social Values
Civic Values

Unit 4
Professional Grooming
Interpersonal Skills
Customer Relations
Personal Brand Building
Professional Etiquette
Internet Tool Kit

Course Title: Extracurricular Activity- Practical	
Semester : II I Course code :	**Credits:02 I Core**
No of sessions Lectures/Tutorial:	**Total Marks: 70**
Course Pre-requisites:	**Timing: 3 Hours**

Instructions for paper setter: examiner is requested to set one compulsory and eight other questions, two from each unit. The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Course learning outcomes

After completing this course, the learner will be able to know/understand:

CLO1- Importance of extra-curricular activities

CLO2- Benefits extra-curricular activities

CLO3- Enhance personal growth of student.

CLO4- it will contribute to improved academic performance

Course Contents

Unit I
Co-curricular and extra-curricular activities, importance of extracurricular activities
Unit II
The role of extracurricular activities in student development, benefits of extracurricular activities, best practices for implementing extracurricular activities
Unit III
Participation in extra-curricular activities. Advantages of participation, disadvantages of participation, requirements for activity participation, guidelines for dual-sport participation
Unit IV
Outcome of extracurricular activities

Course Title: **Yoga and meditation**	
Semester :II | Course code:	Credits:02 | Core
Number of sessions: 20	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Course learning Outcomes

After completing this course, the learner will be able to know/understand:

CLO1- The basic concepts of yoga system

CLO2- The basic concept of mediation

CLO3- The basic steps of asana

CLO4- The relevance of yoga philosophy

Course contents

Unit I

Meaning, definition and nature of yoga

Chitta, cittavratti,and chittabhumi.

Unit II

Type of yoga: karma yoga, gyana yoga, bhakti yoga

Unit III

Astanga Yoga(yam, niyama,aasan, pranayam, pratyaahar, dharna, dhayan and samadhi)

Unit IV

Method, precautions and merit of the following Asana: Vajrasana: sirshasana: Makarasana: Bhujangasana etc.

FOURTHSEMESTER

Syllabus:

Course Title: Applied Bacteriology- Theory	
Semester : IV I Course code:	Credits:03 I Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: This Part will cover the laboratory strategy in the diagnosis of various infective syndromes i.e., choice of samples, collection and transportation and processing of samples for isolation of bacterial pathogens and then to put antibiotic susceptibility testing. This will also cover bacteriological examination of water, milk, food, air, I/V fluids and nosocomial infections. Further it will make the candidate familiar to epidemiology, epidemiological markers and preservation of microbes.

Course outcome- This part will cover the laboratory strategy in the diagnosis of various infective syndromes i.e. choice of samples, collection and transportation and processing of samples for isolation of bacterial pathogens and then to put antibiotic susceptibility testing. This will also cover bacteriological examination of water, milk, food, air, I/V fluids and nosocomial infections. Further it will make the candidate familiar to epidemiology, epidemiological markers and preservation of microbes.

Course content

Unit-1:

1. Laboratorystrategyinthediagnosisofvariousinfectivesyndromes:Samplesofchoice, collection,transportationandprocessingofsamplesforlaboratorydiagnosisofthefollowing
   - 1.1 complications: Septicemia and bacteremia
   - 1.2 Upper Respiratory tract infections
   - 1.3 Lower respiratory tract infections
   - 1.4 Wound, skin, and deep sepsis
   - 1.5 Urinary tract infections
   - 1.6 Genital Tract infections
   - 1.7 Meningitis
   - 1.8 Gastro intestinal infections
   - 1.9 Enteric fever
   - 1.10 Tuberculosis(Pulmonary and Extra-pulmonary)
   - 1.11 Pyrexia of unknown origin

Unit-2: Antibiotic susceptibility testing in bacteriology:

1.1 Definition of antibiotics
1.2 Culture medium used for Antibiotic susceptibility testing
1.3 Preparation and standardization of inoculum
1.4 Control bacterial strains
1.5 Choice of antibiotics
1.6 MIC and MBC: Concepts and methods for determination
1.7 Various methods of Antibiotic susceptibility testing with special ference to Stokes and Kirby-
1.8 Bauer method

Unit 3

1. Basics of Nucleic acid techniques in diagnostic microbiology with special reference to Polymerase chain reaction (PCR)
2. Automation in bacterial culture detection and antimicrobial susceptibility testing.
   Sterility testingof1/v fluids & Nosocomial Infection:
3. Collection, transportation and processing of1/v fluids for bacterial contamination, Recording the result and interpretation
4. Nosocomial Infection: Introduction, sources and types of nosocomial infections.
5. Surveillance of hospital environment for microbial load, Role of microbiology laboratory in control of nosocomial infections
6. Epidemiologicalmarkers:Introduction,Types,Serotyping,PhagetypingandBacteriocintyping

Unit-4: Examination of Milk and milk products

1. Basic Concepts regarding
2. gradation of milk, Various tests for Bacteriological examination of milk
3. Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc.
4. VarioustestsforBacteriologicalexaminationwithspecialreferencetofoodpoisoningbacteria
5. Examination of Air, Significance of air bacteriology in healthcare facilities, Collection processing and reporting of an air sample

Reference Book:

1. PracticalMedicalMicrobiologybyMackie&McCartneyVolume1and2
2. Text book of Microbiology by Anantha narayanan

Course Title: Applied Hematology- Theory	
Course code:	Credits:03 Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: The students will be made aware of the methods of estimating different components of blood. Students will learn the basic concepts of staining and coagulation in Hematology laboratory.

Course outcome- The students will be made aware of the methods of estimating different components of blood. Students will learn the basic concepts of staining and coagulation in Hematology laboratory.

Course content-

Unit-1:

1. Haemoglobinometry: Different methods to measure Hemoglobin with merits and demerits
2. Haemocyto metery: Introduction, Principle, Reagent preparation, procedure, errors involved and means to minimize errors.
3. RBC,s & WBC,s Count
4. Platelets & Absolute Eosinophils Count
5. Principle mechanism and different methods with merit and demerits for the measuring ESR Principle mechanism and different methods with merit and demerits for the measuring PCV.
6. Preparation of thin and thick smears and its uses; staining of blood smears
7. Differential leucocytes count by manual and automated method

Unit-2:

Romanowsky Stain: Principle, composition, preparation of staining reagents and procedure of the following stains: Giemsa's stain, Leishman's stain
Wright's stain, Field's stain, JSB stain.
Differential leucocytes count by manual and automated method
Physiological and pathological variations in leukocyte values
Semen analysis: Sample Collection, Transportation Preservation, Physical Examination, Biochemical Examination &Microscopic Examination.
CSF analysis: Sample Collection, Transportation Preservation, Physical Examination, Biochemical Examination &Microscopic Examination.
Pleural Fluid analysis: Sample Collection, Transportation Preservation, Physical Examination, Biochemical Examination &Microscopic Examination.
Others Fluid analysis: Sample Collection, Transportation Preservation, Physical Examination, and Biochemical Examination & Microscopic Examination.

Automation in Haematology:

Safety precautions in Haematology

Principle of automated blood cell counter; Uses, care, maintenance and calibration of automated blood cell counter

Automatic ESR analyzer, urine analyzer

Coagulometer

Unit-3: Bone Marrow Examination:

Composition and functions, Aspiration of bone marrow(Adults and children)

Processing of aspirated bone marrow (Preparation & staining of smear)

Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios)

Processing and staining of trephine biopsy specimens

Red Cells Indices:

Red cell anomalies

Morphological changes such as variation in size shape & staining character.

MCV,MCH, MCHC&RDW

Reticulocytes: Definition, different methods to count, Absolute reticulocyte count

Unit-4: LEC ells & Factors Deficiency:

Lupus Erythematosus (LE)cell phenomenon: Definition of LE. cell.

Demonstration of LE. cell by various methods & Clinical significance.

Quantitative assay of coagulation factors: Principle, Procedure

Screening of inhibitors

Cytochemical Stains Used in Haematology:

Karyo typing: Chromosomal studies in hematological disorders (PBLC and Bone marrow)

Cyto-chemical staining: Principles, method and significance

Reference Book:

1. Textbook of Medical Laboratory Technology by PrafulB.Godkar
2. Medical laboratory Technology by K.L.Mukherjee Volume-I
3. Practical Haematology byJ.B.Dacie
4. Clinical Diagnosis & Management by Laboratory methods(20th edition) by John Bernard Henry

Course Title: Analytical Clinical Biochemistry- Theory	
Semester: IV |Coursecode:	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: The students will learn basic principles/mechanisms, procedures and various types of techniques commonly performed in analytical biochemistry

Course outcome- Students are able to perform the various test from various automated analyser.

Course content-

Unit-1: Spectrophotometry and colorimetry:

1. Introduction, Theory of spectrophotometry and colorimetry,
2. Lambert's law and Beer's law
3. Applications of colorimetry and spectrophotometry.

Unit-2: Photometry:

1. Introduction, General principles of flame photometry
2. Limitations of flame photometry, Instrumentation
3. Applications of flame photometry
4. Atomic absorption spectroscopy-Principle& applications.

Unit-3: Chromatography:

1. Paper Chromatography & Gel Chromatography :Introduction, principle, types, details for qualitative and quantitative analysis, application.
2. Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography.
3. Column chromatography& Gas chromatography: Introduction, principle column efficiency, application of column chromatography.
4. Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application.

Unit-4: Electrophoresis:

1. Introduction, Principle, Instrumentation, Applications
2. Types of electrophoresis, Paper electrophoresis
3. Gelelectrophoresis.

Reference Book:

- PracticalClinicalBiochemistrybyHaroldVarley
- TextbookofMedicalLaboratoryTechnologybyP.B.Godker
- MedicalLaboratoryTechnologybyMukherjee
- PrincipalofBiochemistryby M.A.Siddiqi
- InstrumentalAnalysisbyChatwal Anand

Course Title: Applied Histopathology- Theory	
Semester :IV |Coursecode:	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: In this section, students will be made aware of terminology used in histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

Course outcome- in this subject students are able to understand and perform the basic tissue processing steps

Unit-1: Introduction:

1. Introduction to Histo technology
2. Compound microscope: Optical system, magnification and maintenance.
3. Applications of various types of microscopes i.e .dark field, polarizing, phase contrast, interference and fluorescent microscope
4. Care and maintenance of laboratory equipment used in histotechnology

Fixation &Decalcification:

1. Safety measures in a histopathology laboratory
2. Basic concepts about routine methods of examination of tissues: Collection and transportation of specimens for histological examination
3. Basic concepts of fixation: Various types of fixatives used in a routine histopathology laboratory, Simple fixatives, Compound fixatives Special fixatives for demonstration of various tissue elements
4. Decalcification: Criteria of a good decalcification agent, Technique of decalcification followed with selection of tissue, fixation.

Unit-2: Tissue Processing:

1. Processing of various tissues for histological examination, Steps & Methods.
2. Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue processing.
3. Components & principles of various types of automatic tissue: Processors
4. Embedding: Definition Various types of embedding media

Section Cutting:

1. Section Cutting: Introduction regarding equipment used for sectioning

2. Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications .
3. Freezing Microtome and various types of Cryostats.
4. Faults in paraffin section cutting with reason and remedy, spreading the sections and attachment or mounting of sections to glass slides.

Unit-3: Staining, Impregnation and Mountants

1. Accentuators, Metachromasia
2. Preparation of Stains, solvents, aniline water and buffers etc.
3. General Staining Procedures for Paraffin Infiltrated and Em bedded tissue, Nuclear Stains and Cytoplasmic stains
4. EquipmentandProcedureformanualStainingandAutomaticStainingTechnique
5. Cryostat sectioning, it s applications in diagnostic histopathology.
6. Connectivetissuestainsandstainingmethods,properties,PTAH,Reticulin,verhoff
7. Massontri chrome, VenGiesson, Heidemhain'sAniline Blue Method
8. Mucin: Types, various stains and staining methods PAS, _alcianblue, Mucicarmine.

1. **Lipids:** Types, identification with various stains and staining method.
2. **Pigments:** Various pigments, identification with various stains methods and staining (hemosiderin melanin}.
3. **Miscellaneous**(calcium) Vonkossa's Stains
4. **Amyloid:** - Toludineblue, Meta chromatic Stains.

Unit-4:

1. Identification of microorganisms using various stains. Modified Giemsa Stains, Silver Nitrate.
2. Demonstration of Proteins & nucleic acids.
3. Tissue requiring special treatment i.e., eyeball, bone marrow, and muscle biopsy
4. Under calcified or unqualified bones, whole brain, and whole lungs including other large organs.
5. Immuno histochemical and immune cyto chemical staining, quality control.
6. Enzyme histochemistry: introduction, Diagnostic applications
7. Demonstration of Phosphatases, Dehydrogenases.
8. Neuro-pathological techniques.
9. Museum techniques.
10. Electron Microscope: working principle and its components
11. Processing, embedding and ultra-microtomy

Reference Book:

1. Handbook of Histopathological Techniques by CFA Culling
2. Medical Labtechnology byLynch
3. An Introduction to Medical Lab Technology by FJ Baker

Course Title: Applied Clinical Biochemistry-1- Theory	
Semester: IV | Course code:	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: The students will be taught about Hazards & safety measures in a clinical biochemistry lab, Quality control and quality assurance, Principles of assay procedures and Estimation of various Investigations in Biochemistry Lab.

Course outcome- The students will learn basic principles/mechanisms, procedures and various types of techniques commonly performed in analytical biochemistry

Course content-

Unit-1:

1. Hazards & safety measures in clinical Biochemistry laboratory
2. Qualitycontrolandqualityassuranceinaclinicalbiochemistrylaboratory
3. Laboratory organization
4. Management and maintenance of records
5. Acid base balance, action of buffer system
6. H b buffers

Unit-2:

1. Principlesofassayprocedures,Normalrangeinblood,Serum,PlasmaandUrineandreferenc e values for: Glucose, Proteins
2. Urea, Uric acid
3. Bilirubin, SGOT&SGPT,ALP
4. Lipids

Unit-3:

1. Principles, procedures for estimation &assessment of the following including errors involved and their corrections: Sodium, Potassium
2. Chloride, Iodine
3. Calcium
4. Phosphorous and Phosphates

Unit-4:

1. Instruments for detection of Radioactivity
2. Applications of Radioisotopes in clinical biochemistry.
3. Enzyme linked immunesorbentassay(ELISA)
4. RIA

5. Respiratoryandmetabolicacidosis,respiratoryandmetabolicalkalosis,
6. Arterial blood as analysis, blood gas analyzer.

Reference Book:

1. Textbook. Of Medical Laboratory Technology by P.B.Godkar.
2. Medical Laboratory Science, Theory & Practical by A.Kolhatkar.
3. Practical Clinical Biochemistry by Harold Varley.
4. Biochemistry, U.Satyanarayan & U.Chakrapani.

PRACTICAL

Course Title: Applied Bacteriology- Practical	
Semester :IV **| Course code:**	**Credits:02 | Core**
Number of Session:40	**Total Marks: 70**
Course Pre-requisites:	**Timing: 3 Hours**

PRACTICAL

1. Inoculation of different culture media
2. Isolation of pure cultures
3. Processing of following clinical samples for culture and identification of bacterial pathogens:
   - 3.1 Blood
   - 3.2 Throat swab
   - 3.3 Sputum
   - 3.5Pus
   - 3.5Urine
   - 3.6 Stool for Salmonella, Shigella and Vibrio cholerae
   - 3.7C.S.F. and other body fluids

Course Title: Applied Haematology- Practical	
Semester: IV **| Course code:**	**Credits:02 | Core**
Number of Session:40	**Total Marks: 70**
Course Pre-requisites:	**Timing: 3 Hours**

1. Estimation of Haemoglobin
   - 1.1 Sahli's method
   - 1.2 Cyanmethahaemoglobin method
   - 1.3 Oxyhaemoglobin method
2. Total leukocyte count
3. Platelets count
4. Absolute Eosinophil count

5. Preparation of smear and staining with Giemsa and Leishman stain.
6. ESR (Wintrobe and Westergren method)
7. Packed cellvolume (Macro&Micro)
8. Routine Examination of CSF
9. Review the morphology of Normal and abnormal RBCs
10. Review the morphology of normal and immature WBCs
11. Quantitative Factor assays:

    1 FactorVIII
    2 FactorIX
    3 FactorVII
    4 FactorX
    5 FactorV

1. Quantification of inhibitors (Bethesda method)
2. APLA: Lupus Anticoagulant(LA)
3. Anti- cardio lipinanti bodies(ACA)
4. Perform Euglobulin clot lysis test (ELT)
    a. Urea clot solubility test for factor XIII.

Course Title: Analytical Clinical Biochemistry- Practical	
Semester: IV **|Coursecode:**	**Credits:02** **| Core**
Number of Session:40	**Total Marks: 70**
Course Pre-requisites:	**Timing: 3 Hours**

1. To demonstrate the principle, working & maintenance of spectrophotometer.
2. To demonstrate the principle, working & maintenance of colorimeter.
3. To demonstrate the principle, working & maintenance of flame photometer.
4. To demonstrate the principle, procedure of paper chromatography.
5. To demonstrate the principle & procedure of Gas chromatography.
6. To demonstrate the principle & demonstration of TLC.
7. To demonstrate the principle & procedure of column chromatography.
8. To demonstrate the principle & procedure of Electrophoresis.

Course Title: Applied Histopathology- Practical			
Semester :IV	Coursecode:	Credits:02	Core
Number of Session:40		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

1. To cut frozen section and stain for Haematoxylin and Eosin, Metachromatic stain Toluidine blue and Oil RedO' staining for the demonstration of fat

2. To prepare Schiff's reagent in the lab and do Periodic Acid Schiff's(PAS) stain on a Paraffin section

4. Tostainaparaffinsectionforthedemonstrationofsmoothmusclebyvangieson'sStain

5. To perform Masson's trichrome stain on a paraffin section for the demonstration of collagen fiber, muscle fiber and other cell elements.

6. To stain the paraffinsection for the demonstration of the elastic fibers(EVG).

7. To stain Decalcified paraffin embedded section for the presence of calciumsalts (Von Kossa's method).

8. To stain aparaffinsection for the following Mucicarmine,Alcianblue.

9. To stain aparaffinsection for the demonstration of iron(Perl'sstain)

10. To demonstrate the presence of bacteria and fungiinparaffinembedded sections using the following staining procedures:

10.1 Gram'sstaining

10.2 AFBstaining(ZiehlNeilson'sstaining)forM.tuberculosisandleprae

10.3 Grocott'sstainforfungi

11. To cut frozen section and stain for Haematoxylin and Eosin, Metachromatic stain -Toluidine blue and Oil RedO' staining for the demonstration of fat

Course Title: Applied Clinical Biochemistry-1- Practical			
Semester :IV	|Coursecode:BMLS410P	Credits:02	| Core
Number of Session:40		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.
3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum Bilirubin
6. Estimation of Total Cholesterol in blood.
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.
9. Estimation of TG
10. Estimation of Creatinine in Blood
11. Estimation of serum calcium, Inorganic phosphate
12. To measure electrolytes Sodium, Potassium & Chloride.

Course Title: Environmental Science- Theory			
Semester: IV	|Coursecode:BMLS411T	Credits:02	| Core
No of sessions Lectures/Tutorial:20		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Course Objectives

The broad objectives of this course are

- Togainanunderstandingoftheconceptsfundamentaltoenvironmentalscience

- Tounderstandthecomplexityofecosystemsandpossiblyhowtosustainthem
- To understand the relationships between humans and the environment.
- To understand major environmental problems including their causes and consequences.

Course outcome- The student will be made aware of our environment in general, Natural Resources, Ecosystems, Environmental Pollution, and Social issues related to environment, Human Population and the Environment and understanding the Hospital Environment.

Course Contents

The class would meet twice in a weekforaperiodof10weeksapprox.

Unit1.Introduction

Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.
Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

Unit 2.Ecosystems

Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity

Unit3.EnvironmentalPollution

Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Solid waste management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies, Disaster management: Floods, earthquake, cyclone and landslides.

Unit4.SocialblemishesandtheEnvironment

From Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, water shed management Resettlement and rehabilitationof people; its pros and concerns. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness.
Human Population and the Environment, Population growth, variation among nations. Population explosion-Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies. Understanding the Hospital Environment

Reference Books:

Reference1: Jadhav, H &Bhosale, V.M., 1995. Environmental Protection and Laws. Himalaya Pub. House, New Delhi.
Reference 2: Gadi R.,Rattan, S., 2006. Environmental Studies, KATSON Books, New Delhi.
Reference3:Mckinney,M.L.&School,R.M.,1996.Environmental Science Systems & Solutions, Web enhanced edition.

Papers:

- Beckerman, W. (1992). Economic growth and the environment: Whose growth? Whose environment? *World Development, 20(4),* 481-496.
- Lorente, D.B., Shahbaz, M., Roubaud, D., Farhani, S. (2018) How economic growth, renewable electricity and natural resources contribute to CO2 emissions? *Energy Policy, 113(C), 356-367.*
- Kumar Reddy D.H., Lee S.M. (2012) Water Pollution and Treatment Technologies, *J Environ Anal Toxicol, 2(5)* el 03.

SIXTH SEMESTER

Syllabus

Course Title: Cytopathology-Theory	
Semester: VI |Coursecode:	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: The student's will earn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens.

Course outcome- The students will be able about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens.

Course content-

Unit-1: Introduction:

1. Introduction, Definition, Branches of Cytopathology.
2. Aspiration cytology- Principles, indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics
3. Equipment's used in FNAC clinics.
4. Exfoliative Cytology- Principles, indications and utility of the technique, Sampl collection, labelling, preparation, processing of cervical, endometrial, respiratory tract, gastrointestinal tract and urinary tract sample, Smear preparation.

Unit-2: Diagnostic Cytopathology:

1. Fixatives and fixations:-types, uses, merits, demerits.
2. Cell Block preparation.
3. Cryostat sectioning, its applications in diagnostic cytopathology
4. Vital staining for Sex Chromatin
5. PAS, Alcian Blue, Mucicarmin, Giemsa, Sudan

Unit-3: Enzyme Cytochemistry & Fluid Cytology:

1. Enzyme Cytochemistry: Diagnostic applications
2. Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases
3. Fluid Cytology: -Sample Collection, Assessment of smearing and staining
4. Urine, CSF, Body Fluids (Pleural, Pericardial, Ascetic).

Unit-4: Automation in Cytology &Staining:

1. Liquid based cytology: Principles and preparation
2. Cytocentrifuge, molecular cytology
3. Immune- cytochemistry
4. MGG & PAP Staining

Reference Book:

1. Handbook of Histopathological Techniques by CFA Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by FJ Baker and Silverton

Course Title: Medical Virology & Mycology-Theory			
Semester: VI	**Course code:**	**Credits:03**	**Core**
No of sessions Lectures/Tutorial:30		**Total Marks: 70**	
Course Pre-requisites:		**Timing: 3 Hours**	

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important Viruses & Fungi.

Course Outcome- Understanding about the laboratory diagnosis of various Medically important Fungi and Viruses.

Unit-1: Introduction to Virology:

1. Introduction to medical virology, Introduction to medically important viruses.
2. Structure and Classification of viruses
3. Collection, transportation and storage of sample for viral diagnosis.
4. Staining techniques used in Virology

Unit-2: Virus Culture:

1. Processing of samples for viral culture (Egg inoculation and tissue culture).
2. Modes of viral transmission : Persistent, non-persistent, vertical and horizontal
3. Viral multiplication and replication strategies:
4. Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions.

Details of Viruses:

1. Poxviruses, Herpesviruses, hepaptitis viruses, retroviruses-HIV, Picorna viruses, rhabdo viruses
2. Orthomyxo viruses and paramyxo viruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV
3. Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis.
4. Introductiontooncogenicviruses,TypesofoncogenicDNAandRNAviruses,conceptsof oncogenes and proto-oncogenes
5. Prevention&controlofviraldiseases,antiviralcompoundsandtheirmodeofaction, interferon and their mode of action, General principles of viral vaccination

Unit-3: Introduction to Mycology:

1. Introduction to Medical Mycology Basic concepts about superficial and deep Mycoses
2. Taxonomy and classification and general characteristics of various medically important fungi Normal fungal flora.
3. Techniques used for isolation and identification of medically important fungi.
4. Direct microscopy in medical mycology laboratory, Processing of clinical samples for diagnosis of fungal infections i.e., Skin, nail, hair, pus, sputum, CSF and other body fluids.

Unit-4: Details of Fungi:

1. Morphology, Diseases & lab diagnosis of: Candida, Dermatophytes, Mycetoma (Eumycetoma & Actionomycetoma), Cryptococcus, Histoplasmosis
2. Opportunistic Fungi, Blastomyces, coccidioidosis, Nocardia.
3. Methods for identification of yeasts and moulds, Dimorphism in fungi, Antifungal susceptibility tests.
4. Preservation of fungal cultures, Routine myco-serological tests and skin tests.

Reference Book:

1. PracticalMedicalMicrobiologybyMackie&MaccartneyVolume1and2
2. Textbook of Microbiology by Anantha narayanan
3. Medical Microbiology by Panikar & Satish Gupte
4. Medical laboratory Technology Vol.I, II,III by Mukherjee

Course Title: Blood Banking & Genetics-Theory			
Semester: VI	Course code:	Credits:03	Core
No of sessions Lectures/Tutorial:30		Total Marks: 70	
Course Pre-requisites:		Timing: 3 Hours	

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: Blood banking will make students learn about blood grouping & blood, Transfusion. The students will learn about the concept of blood grouping, compatibility testing in blood transfusion &screening of donated blood for various Infection Diseases. Genetics will make students learn about Fundamentals of Heredity. The students will learn about the concept of inheritance in various genetic diseases.

Course outcome- Gain knowledge about the transfusion & screening of donated blood for various infectious diseases.

Unit-1: History, technique &Discovery of Blood Group:

1. History and discovery of blood group system
2. ABO and Rhesus blood group system
3. Cell and serum grouping
4. Various methods, interpretation of results.
5. Discrepancies in blood grouping and resolving problems
6. Variants of D antigen and weak D typing.
7. Compatibility testing: -definition, indication methods.
8. Coombs test: -Direct, indirect, principle, procedure, interpretation, applications.

Unit-2: Blood Components:

1. Blood component: Preparation, labeling, storage, cell separator
2. Preparation of packed cells and various fractions of blood for transfusion purposes.
3. Preparation of PRP, FP, FFP and Cryoprecipitate
4. Total quality management, documentation record keeping.

Unit-3: Transfusion Reactions:

1. Transfusion reactions: Definitions, classification & Causes
2. Laboratory investigation of transfusion reactions and mismatched, transfusion reactions.
3. Compatibility tests in blood transfusion, complications and hazard of blood transfusion.
4. Transfusion transmissible diseases, screening methods (Sample collection, processing, handling and disposal).

Unit-4: Genetics:

1. Continuity of life-heredity, variation
2. Mendel'slawsofinheritance,Chromosomalbasisofinheritance;otherpatternsofinheritance
3. Incomplete dominance, multiparallelism, quantitative inheritance.
4. Chromosomes-Bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination.
5. Molecular genetics: DNA as a genetic material-its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids, Human Genetics, Microbial genetics.

Reference Book:

1. Practical Haematology byJ.B.Dacie
2. Transfusion Science byOverfield, Hamer
3. Medical Laboratory Technology byK.L.Mukherjee Volume-I
4. Mollison's Blood Transfusionin ClinicalMedicine,12thEditionbyHarveyG.Klein
5. Genes by Benjamin Lewin

Course Title: Research Methodology and Biostatistics-Theory	
Semester: VI | Course code:	Credits:03 | Core
No of sessions Lectures/Tutorial:30	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Instructions for paper setter: Examiner is requested to set **one compulsory and eight other questions, two from each unit.** The compulsory question should be of 14 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

Learning Objectives: The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about therelation between data and variables.

Course outcome- Students will be able to understand and gain knowledge about the methodology and biostatistics in research.

Unit-1:

1. Research Methodology: Introduction to research methods
2. Identifying research problem.
3. Ethical issues in research-Research design
4. Basic Concepts of Biostatistics.

Unit-2:

1. Types of Data
2. Research tools and Data collection methods
3. Sampling methods
4. Developing a research proposal

Unit-3:

1. Biostatistics:Needofbiostatistics,whatisbiostatistics:beyonddefiniti on
2. Understanding of data in biostatistics
3. How & where to get relevant data, Relation between data & variables.
4. Typeofvariables: defining data set, Collection of relevant data: sampling methods.

Unit-4:

1. Normal Distribution
2. Standard deviation, Standard errors.
3. Coefficient of Variation
4. t-test, Chisquare test.

Reference Book:

1. Statistical Methods by S.P.Gupta
2. Method sin biostatistics for medical students by B.K. Mahajan

PRACTICALS

Course Title: Cyto pathology-Practical	
Semester: VI | Course code:	Credits:02 | Core
Number of Session:40	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

PRACTICAL

1. To perform Papnicolaou's stain on cervical smear
2. To perform Guard's staining for demonstration sex chromatin (Barr bodies on a buccal smear)
3. To perform Shorr's staining for Hormonal assessment
4. To cut frozen sections of Gynaec tissue
5. To perform CSF sample and body fluids by cytospin
6. Should know the various stains used in Cytology lab, May Grunwald Giemsa, H&E,PAS, Grocott's.

Course Title: Medical Virology and Mycology -Practical	
Semester: VI | Course code:	Credits:02 | Core
Number of Session:40	Total Marks: 70
Course Pre-requisites:	Timing: 3 Hours

Practical:

1. To prepare culture media used routinely in mycology
2. To perform KOH preparation, Gram stain, Potassium Hydroxide –Calcoflu or White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, LCB preparation.
3. To identify given yeast culture by performing various

identification techniques studied in theory.

4. To identify given mould culture by performing various

   identification techniques studied in theory.

5. To collectandprocessclinicalsamplesforlaboratorydiagnosisoffungalinfectionsi.e.

   Skin, Nail, Hair, Body fluids and secretions

6. To demonstrate structure of viruses and their multiplication from chartsetc.
7. To perform Giemsa stain, Seller's stain, immune fluorescent

   staining procedures for diagnosis of viral infections

8. Demonstration of fertilized hen egg
9. Demonstration of various inoculation routes in fertilized hen egg

Course Title: Blood Banking and Genetics -Practical	
Semester: VI **I Course code:**	**Credits:02** **I Core**
NumberofSession:40	**Total Marks: 70**
Course Pre-requisites:	**Timing: 3 Hours**

Practical:

1. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
2. Screening of blood donor: physical examination including medical history of the donor
3. Collection and preservation of blood for transfusion purpose
4. Screening of blood for Malaria, Micro filaria, HBsAg, Syphilis and HIV
5. TodeterminetheABO&Rhgrouping5.1Directorpreliminarygrouping

   5.2 Indirect or proof grouping

5.3 Rh grouping and determination of Du in case of Rh negative

6. To perform Direct and Indirect Coomb's test
7. To perform cross matching

   7.1 Major cross matching

   7.2 Minor cross matching

8. Preparation of various fractions of blood.

Course Title: Project Work- Practical	
Semester: VI **I Course code:**	**Credits:04** **I Core**
Course Pre-requisites:	

Students have to carry out a research project (on any topic related to Operation Theater Technology) under the supervision of a faculty. The project report has to be prepared on the basis of the research work carried out. The assessment is done on the basis of the work done and the presentation and viva.