



# GALGOTIAS UNIVERSITY

## Syllabus of **B.Sc. Medical Laboratory Technology**

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**Name of School:** School of Medical and Allied Sciences

**Department:** Paramedical and Allied Health Sciences

**Year:** 2019-2020



(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

# **School of Medical and Allied Sciences**

Course: B. Sc.(Medical Lab Technology)

**Scheme: 2019 – 2023**

Date of BoS:24/06/2019

## Curriculum

<b>2019-20-Programme Structure</b>					
<b>Course Code</b>	<b>Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SEMESTER-I</b>					
BMLT1001	General Anatomy-I	3	0	0	3
BMLT1002	General Physiology -I	3	0	0	3
BMLT1003	Basic Biochemistry	3	0	0	3
ENVS1001	Energy & Environmental Sciences	3	0	0	3
FENG1001	Functional English-I	3	0	0	3
BMLT1051	General Anatomy Lab-I	0	0	2	1
BMLT1052	General Physiology Lab-I	0	0	2	1
BMLT1053	Biochemistry Lab-I	0	0	2	1
FENG1002	Functional English Lab-I	0	0	2	1
	<b>TOTAL</b>				<b>19</b>

<b>SEMESTER-II</b>					
BMLT2001	General Anatomy- II	3	0	0	3
BMLT2002	General Physiology-II	3	0	0	3
BMLT2003	Biochemical metabolism	3	0	0	3
BMLT2004	General Microbiology	3	0	0	3
FENG1003	Functional English-II	3	0	0	3
BMLT2051	General Microbiology Lab	0	0	2	1
BMLT2052	Biochemical metabolism Lab	0	0	2	1

FENG1004	Lab Functional English-II	0	0	2	1
TOTAL					18

#### SEMESTER-III

BMLT3001	Systemic bacteriology	3	0	0	3
BMLT 3002	Pathology	3	0	0	3
BMLT3003	Analytical biochemistry	3	0	0	3
COMP1111	Computer Fundamentals	3	0	0	3
BMLT3004	Laboratory Quality Management-I	2	0	0	2
BMLT3005	Infection Control and Prevention-I	2	0	0	2
BMLT3051	Analytical biochemistry Lab	0	0	2	1
BMLT3052	Pathology Lab	0	0	2	1
BMLT3053	Systemic bacteriology Lab	0	0	2	1
COMP1112	Computer Fundamentals Lab	0	0	2	1
TOTAL					18

#### SEMESTER-IV

BMLT4001	Hematology & hematological diseases	3	0	0	3
BMLT4002	Immunology and serology	3	0	0	3
BMLT4003	Clinical Biochemistry	3	0	0	3
BMLT4004	Laboratory Quality Management-II	2	0	0	2
BMLT4005	Infection Control and prevention-II	2	0	0	2
BMLT4051	Hematology & hematological diseases Lab	0	0	2	1
BMLT4052	Immunology and serology Lab	0	0	2	1
BMLT4053	Clinical Biochemistry Lab	0	0	2	1

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**SEMESTER-V**

BMLT5001	Virology & Mycology	3	0	0	3
BMLT5002	Transfusion Medicine	3	0	0	3
LLL101	Universal human values and ethics	3	0	0	3
BMLT5003	Medical Laboratory Technician-I	6	0	0	6
BMLT5004	Phlebotomy-I	6	0	0	6
BMLT5051	Virology & Mycology Lab	0	0	2	1
BMLT5052	Transfusion Medicine Lab	0	0	2	1
BMLT5053	Medical Laboratory Technician Lab-I	0	0	6	3
BMLT5054	Phlebotomy Lab-I	0	0	6	3
					20

**SEMESTER-VI**

BMLT6001	Parasitology	3	0	0	3
BMLT6002	Clinical Laboratory Practice (CLP)	3	0	0	3
BMLT6003	Research Methodology & Biostatistics	3	0	0	3
BMLT6004	Medical Laboratory Technician-II	6	0	0	6
BMLT6005	Phlebotomy-II	6	0	0	6
BMLT6052	Medical Laboratory Technician Lab-II	0	0	6	3
BMLT6053	Phlebotomy Lab-II	0	0	6	3
BMLT6054	Microbiology (Project)	0	0	0	2
BMLT6055	Biochemistry (Project)	0	0	0	2

BMLT6056	Hematology (Project)	0	0	0	2
BMLT6057	Transfusion Medicine(Project)	0	0	0	2
					20

**SEMESTER-VII**

BMLT 7001	Professional Training	0	0	40	20
	<b>Total</b>				20

**SEMESTER-VIII**

BMLT 8001	Professional Training	0	0	40	20
	<b>Total</b>				20
	<b>Total</b>				<b>149</b>

**List of Electives**

**Semester-III**

Sl No	Course Code	Name of the Electives					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BMLT3004	Laboratory Quality Management-I	2	0	0	2	10	20	70
2	BMLT3005	Infection Control and Prevention-I	2	0	0	2	10	20	70

**Semester-IV**

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BMLT4004	Laboratory Quality Management-II	2	0	0	2	10	20	70
2	BMLT4005	Infection Control and prevention-II	2	0	0	2	10	20	70

**Semester-V**

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
		<b>Theory Course</b>							
1	BMLT5003	Medical Laboratory Technician-I	6	0	0	6	10	20	70
2	BMLT5004	Phlebotomy-I	6	0	0	6	10	20	70
		<b>Practical Courses</b>							
1	BMLT5053	Medical Laboratory Technician Lab-I	0	0	6	3	10	20	70
2	BMLT5054	Phlebotomy Lab-I	0	0	6	3	10	20	70

**Semester-VI**

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
		<b>Theory Course</b>							
1	BMLT6004	Medical Laboratory Technician-II	6	0	0	6	10	20	70
2	BMLT6005	Phlebotomy-II	6	0	0	6	10	20	70
		<b>Practical Courses</b>							
1	BMLT6052	Medical Laboratory Technician Lab-II	0	0	6	3	10	20	70
2	BMLT6053	Phlebotomy Lab-II	0	0	6	3	10	20	70
		<b>Project Courses</b>							
1	BMLT6054	Microbiology (Project)	0	0	0	2	30		70
2	BMLT6055	Biochemistry (Project)	0	0	0	2	30		70
3	BMLT6056	Hematology (Project)	0	0	0	2	30		70
4	BMLT6057	Transfusion Medicine (Project)	0	0	0	2	30		70

# Detailed Syllabus



<b>Name of The Course</b>	General Anatomy- I			
<b>Course Code</b>	BMLT1001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1 To develop the knowledge about various anatomical planes, Movements and organ systems of human body
- 2 To gain the knowledge of Axial, Appendicular and lower limbs and cavities of the human body
- 3 To learn the morphology and types of various tissues in human body
- 4 To know the anatomy of digestive system in human body

### Course Outcomes:

On completion of course student will be able to,

<b>CO1</b>	Demonstrate anatomical position planes, Types of movement & organ systems of body
<b>CO2</b>	Show Axial, Appendicular skeleton, Lower upper limbs & Cavities of Body
<b>CO3</b>	Differentiate types of tissues in human body
<b>CO4</b>	Describe and teach the anatomy of digestive system of human body
<b>CO5</b>	Describe and teach the urinary system of human body

### Text Book (s)

1. Text book of Anatomy & Physiology by P.R Ashalatha
2. Text book of Anatomy & Physiology by Ross & Willson

### Reference Book (s)

- 1.Text Book of Anatomy by B.D.Chaurasiya
- 2.Anatomy Review by Gray's

<b>Unit-1 Introduction to Anatomy</b>	<b>7 hours</b>
Anatomical Position, Anatomical Planes, Types of Movement & Organs systems of body	
<b>Unit-2 Skeletal System</b>	<b>8 hours</b>
Axial Skeleton: Skull & Vertebral column. Appendicular skeleton: Shoulder girdles, upper limbs, pelvic girdle & lower limbs. & Cavities of Body	
<b>Unit-3 Organization of Human body - Tissue level</b>	<b>7 hours</b>
Primary tissues, Epithelial tissue, Simple epithelium, Pseudostratified epithelium, Stratified epithelium, Basement membrane, Glands, Connective tissue, Special connective tissue & Supporting tissues.	
<b>Unit-4 Digestive System</b>	<b>12 hours</b>
Process of Digestion, Parts of digestive system, Pharynx, Salivary glands, Esophagus, Stomach, Small intestine, Large intestine, & Accessory organs of digestion ( Liver, Gall bladder)	
<b>Unit-5 Urinary System</b>	<b>6 hours</b>
Parts of urinary system, Functions of urinary system Kidneys, Nephron, Ureters, Urinary bladder, Male & Female Urethra	

#### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Internal (CAT 1 &amp; CAT 2)</b>	<b>External (ETE)</b>	<b>Total Marks</b>
10	30	60	100

<b>Name of The Course</b>	General Physiology – I			
<b>Course Code</b>	BMLT1002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about the structure of cell organelles, tissues and organ system of the human body.
2. To gain the knowledge of performing ESR, PCV.
3. To learn the functions of muscles and neuromuscular junction.
4. To know the physiology of the digestive system in detail.
5. To understand the renal physiology

### Course Outcomes:

On completion of course student will be able to,

<b>CO1</b>	Demonstrate cell & Cell organelles , Tissues, & Organ systems of Human body
<b>CO2</b>	Perform ESR, PCV, & Teach blood cell functions
<b>CO3</b>	Describe and teach types of muscles and Neuromuscular junction
<b>CO4</b>	Present the functions of Digestive system & Accessory organs of Digestive system
<b>CO5</b>	Illustrate the functions of Renal system & Mechanism of artificial kidney

### Text Book (s)

1. Text book of Medical Physiology by Sembulingam & Prema Sembulingam
2. Text of Anatomy & Physiology by Ross & Willson

### Reference Book (s)

1. Review on Medical Physiology by Guyton and Hall
2. Understanding Medical Physiology by RL Bijlani

<b>Unit-1 Introduction to physiology</b>	<b>8 hours</b>
Cell, Tissue, Organ, System, Structure of Cell, Cell membrane, Functions, of cell wall, Cytoplasm, EPR, Golgi apparatus, lysosomes, Peroxisomes, Nucleus, DNA, RNA, Cell Death, Cell adaptation & Cell degeneration	
<b>Unit-2 Blood</b>	<b>13 hours</b>
Blood, Serum/Plasma, RBC, ESR, PCV, Erythropoiesis, WBC, Platelets, Hemostasis, Coagulation of blood, Blood groups, Blood transfusion & Blood volume	
<b>Unit-3 Muscle physiology</b>	<b>4 hours</b>
Classification of Muscles, Structure of skeletal muscle , Properties of skeletal muscle & Neuromuscular junction	
<b>Unit-4 Digestive System</b>	<b>7 hours</b>
Gastric secretion, Liver, Biliary system. Function of SI & LI, Movements of GIT& Gastro intestinal Hormone	
<b>Unit-5 Excretory System</b>	<b>8 hours</b>
Nephron, Juxtaglomerular Apparatus, Renal circulation, Urine formation, Micturition, Renal function tests, Dialysis & Artificial kidney	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Internal (CAT 1 & CAT 2)	External (ETE)	Total Marks
10	30	60	100

<b>Name of The Course</b>	Basic Biochemistry			
<b>Course Code</b>	BMLT1003			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

**Course Objectives:**

1. To gain the knowledge about various types of carbohydrates and their functions.
2. To gain the knowledge of Lipids, their structure and functions
3. To learn the structure of proteins and their functions
4. To know the structure and functions of DNA & RNA
5. To gain the knowledge of biochemistry of enzymes and its diagnostic applications.

**Course Outcomes:**

On completion of course student will be able to,

<b>CO1</b>	Apply knowledge and describe Carbohydrates and its classification.
<b>CO2</b>	Apply knowledge and describe Lipids and its classification
<b>CO3</b>	Apply knowledge and describe Proteins & its classification
<b>CO4</b>	Apply knowledge and describe on DNA & RNA
<b>CO5</b>	Apply knowledge and describe on Enzymes and their applications in diagnostic purpose

**Text Book (s)**

1. Biochemistry by U.Satyanarayana
2. Biochemistry by D.Vasudevan

**Reference Book (s)**

- 1 Biochemistry by Voet and Voet
- 2 Varley, Clinical Chemistry
- 3 Illustrated Biochemistry by Harper

<b>Unit-1 Introduction of Biochemistry &amp; Carbohydrates</b>	<b>6 hours</b>
Biomolecules & Cell, Carbohydrates Introduction, Functions, Classification, Monosaccharide's, Disaccharides & Polysaccharides	
<b>Unit-2 Lipids</b>	<b>8 hours</b>
Lipids introduction, Functions, Classification, Fatty acids, Essential Fatty acids, Triacylglycerol's, Phospholipids, Glycolipids, Lipoproteins, Steroids, Cholesterol, Soaps & Detergents.	
<b>Unit-3 Proteins &amp; amino acids</b>	<b>8 hours</b>
Introduction of Proteins & amino acids, Functions, Classification , Elemental composition of proteins, Amino acids, Classification, Chemical Properties, Physical properties, Amino acids usefull as drugs, Structure of proteins	
<b>Unit-4 Nucleic Acids &amp; Nucleotides</b>	<b>8 hours</b>
Introduction, History, Functions, Components, Nucleotides, Structure, Nucleotide Analogs, Structure of DNA, Double helix DNA, Conformations of DNA double helix, Other types of DNA Structure. Organization of DNA in cell. Structure of RNA, Types of RNA	
<b>Unit-5 Enzymes</b>	<b>10 hours</b>
Introduction, History, Nomenclature, Chemical Nature, Properties, Factors effecting enzyme activity, Active site, Enzyme inhibition, Enzyme Specificity, Coenzymes, Mechanism of Enzyme action, Units of Enzymes, Non protein Enzymes, Application of Enzymes, Diagnostic Importance, Enzyme pattern in Diseases	

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Internal (CAT 1 &amp; CAT 2)</b>	<b>External (ETE)</b>	<b>Total Marks</b>
10	30	60	100

<b>Name of The Course</b>	Energy and Environmental sciences			
<b>Course Code</b>	ENVS1001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about the environment and its components and Problems associated with natural resources.
2. To gain the knowledge Chemical Toxicity of the chemicals in the environment.
3. To learn the consequences of social problems.
4. To know the role of information technology to address environmental issues.
5. To understand the Applications of sustained Chemistry.

### Course Outcomes:

On completion of course student will be able to,

<b>CO1</b>	Understand About environment and its components and Problems associated with natural resources and their sustainable use
<b>CO2</b>	Chemical Toxicity of the chemicals in the environment and Sources of pollution in air , water and soil and Solid waste management and natural Disaster management.
<b>CO3</b>	Understanding about social issues.
<b>CO4</b>	Understanding of role of information technology to address environmental issues.
<b>CO5</b>	Application of sustained Chemistry.

### Text Book (s)

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.
2. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5
3. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5

### Reference Book (s)

<b>Unit-1 Environment &amp; Natural Resources</b>	<b>6 hours</b>
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources – Use and exploitation, environmental effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.	
<b>Unit-2 Chemical Toxicology</b>	<b>8 hours</b>
Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides	
<b>Unit-3 Environmental Pollution</b>	<b>9 hours</b>
Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.	
<b>Unit-4 Social Issues, Human Population and the Environment</b>	<b>8 hours</b>
Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.	
<b>Unit-5 Green Chemistry</b>	<b>9 hours</b>
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Internal (CAT 1 & CAT 2)	External (ETE)	Total Marks
10	30	60	100



<b>Name of The Course</b>	General Anatomy Lab - I			
<b>Course Code</b>	BMLT1051			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

**Course Objectives:**

1. To identify and get the knowledge about different bones of the skull.
2. To identify and gain the knowledge of different bones of upper limb and lower limb bones and joints
3. To learn the structure of different bones of Vertebrae.
4. To identify the different bones of Pelvic girdle.
5. To understand the histology of Bone, Nerve, Stomach, Intestine & Kidney.

**Course Outcomes :**

On completion of course student will be able to,

<b>CO1</b>	Demonstrate different bones and joints of Human skeletal system
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**Text Book (s)**

1. Text book of Anatomy & Physiology by P.R Ashalatha
2. Text book of Anatomy & Physiology by Ross & Willson
3. William Davis, Understanding Human Anatomy and Physiology, McGraw Hill.

**Reference Book (s)**

1. .Chaurasia's, Practical of Human Anatomy.

<b>List of Experiments</b>	
1	Good Laboratory Practices in Anatomy Lab
2	Dmonstration of Skull bones
3	Demonstration of Upper limb bones
4	Demonstration of Lower limb bones
5	Demonstration of Vertebrae
6	Demonstration of Pelvic girdle
7	Demonstration of Upper limb joints
8	Demonstration of Lower limb joints
9	Histology of Bone
10	Histology of Nerve
11	Histology of Stomach
12	Histology of Intestine
13	Histology of Kidney

**Continuous Assessment Pattern**

<b>Internal (CAT I &amp; CAT II)</b>	<b>External (ETE)</b>	<b>Total Marks</b>
30	70	100

<b>Name of The Course</b>	General Physiology Lab - I			
<b>Course Code</b>	BMLT1052			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge of Haemoglobin estimation.
2. To gain the knowledge differential WBC count.
3. To gain the knowledge on performing Blood group.
4. To know the skills to perform various bleeding disorders.
5. To understand the knowledge of heart sounds and blood pressure.

### Course Outcomes :

On completion of course student will be able to,

<b>CO1</b>	Perform basic parameters in physiology
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### Text Book (s)

1. Text book of Medical Physiology by Sembulingam & Prema Sembulingam
2. Text of Anatomy & Physiology by Ross & Willson
3. A.K Jain, Practical Handbook of Human Physiology.

### Reference Book (s)

- 1.Review on Medical Physiology by Guyton and Hall
- 2.Understanding Medical Physiology by RL Bijlani
- 3.Nageshwari, Practical Workbook of Human Physiology

<b>List of Experiments</b>	
1	Estimation of Haemoglobin
2	Perform total White Blood Cell Count.
3	Perform Red Blood Cell Count.
4	Determination of Blood Groups.

5	Perform Leishman's staining for Differential WBC count.
6	Determination of packed cell Volume.
7	Perform Erythrocyte sedimentation rate [ESR].
8	Calculation of blood indices.
9	Determination of Clotting Time,
10	Determination of Bleeding Time.
11	Determine Blood pressure
12	Perform Auscultation for Heart Sounds.
13	Determination of vital capacity.
14	Perform Electrocardiogram

#### **Continuous Assessment Pattern**

<b>Internal (CAT I &amp; CAT II)</b>	<b>External (ETE)</b>	<b>Total Marks</b>
30	70	100

<b>Name of The Course</b>	Biochemistry Lab -I			
<b>Course Code</b>	BMLT1053			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

**Course Objectives:**

1. To attain the skills to perform Qualitative Analysis of abnormal constituents of Urine
2. To attain the skills to perform Qualitative analysis of unknown carbohydrates Monosaccharides
3. To attain the skills to perform identification of Disaccharides (Lactose Sucrose) and Polysaccharides (Starch)
4. To attain the skills to estimation of Serum protein and blood glucose

**Course Outcomes :**

On completion of course student will be able to,

<b>CO1</b>	Perform basic tests of Biochemistry laboratory
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**Text Book (s)**

1. Biochemistry by U.Satyanarayana
2. Biochemistry by D.Vasudevan

**Reference Book (s)**

1. Biochemistry by Voet and Voet
2. Varley, Clinical Chemistry
3. Illustrated Biochemistry by Harper

<b>List of Experiments</b>	
1	Good medical laboratory practices in Biochemistry lab
2	Qualitative Analysis of abnormal constituents of Urine (Glucose,proteins,ketonebodies,bilesalts,bilepigments,occultblood)
3	Qualitative analysis of unknown carbohydrates Monosaccharides (Glucose,Fructose,Galactose&Maltose)
4	Disaccharides (Lactose &Sucrose)
5	Polysaccharides (Starch)
6	Colorimetry
7	Estimation of Serum protein
8	Estimation of Blood glucose

#### **Continuous Assessment Pattern**

<b>Internal (CAT I &amp; CAT II )</b>	<b>External (ETE)</b>	<b>Total Marks</b>
30	70	100

<b>Name of The Course</b>	Functional English I			
<b>Course Code</b>	FENG1001			
<b>Prerequisite</b>	Understanding of the basics of English language, pronunciation and technical as well as academic writing.			
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

The objective of the course is to:

1. To understand simple texts and a range of high frequency vocabulary in context
2. To describe aspects of personal and everyday life in both oral and written form
3. To produce short and simple connected texts on familiar topics
4. To gain Basic understanding into pronunciation of English sounds

### Course Outcomes:

On completion of course student will be able to,

<b>CO1</b>	Develop the understanding into the communication and language as its medium
<b>CO2</b>	Develop the basic understanding of spoken English
<b>CO3</b>	Improve their reading fluency skills through extensive reading
<b>CO4</b>	Use and assess information from academic sources, distinguishing between main ideas and details
<b>CO5</b>	Compare and use a range official support through formal and informal writings

### Text Book (s)

### Reference(s)

1. Course Title: **Communication Skills** by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)  
[https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29\\_sPwwkzMTYXpaH](https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH)
2. Course Title: **English Language for Competitive Examinations** By Prof. Aysha Iqbal (NPTEL)  
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>
3. Course Title: **Better Spoken English** by Prof. Shreesh Chaudhary, Department of Humanities

and Social Sciences, IIT Madras. (NPTEL)  
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOkQCOElxcD>

Ors

4. Course Title: **Understanding Creativity and Creative Writing** by Prof. Neelima Talwar(NPTEL)

<http://www.digimat.in/nptel/courses/video/109101017/L01.html>

### Detailed Outlines of Course

#### SESSION WISE INSTRUCTION PLAN

		COMMUNICATIVE ENGLISH – I	L	T	P	C
			3	0	0	3
Session No	Module	Topics	Core Reading		Additional Reference	
1-7	I	<ul style="list-style-type: none"> <li>● Communication: Definition, Types (Verbal and Non-verbal), Models, Language as a tool of communication</li> <li>● The flow of Communication, Communication Networks</li> <li>● Barriers to Communication</li> <li>● Professional Communication</li> <li>● Features of professional communication</li> <li>● Importance of Business/Technical Communication</li> </ul>	<i>Technical Communication-Principles and Practices</i> by Meenakshi Raman & Sangeeta Sharma			
8-20	II	<ul style="list-style-type: none"> <li>● Word Formation</li> <li>● Basic sentence structure</li> <li>● Common Errors: Subject- Verb agreement, prepositions, Articles, Place of adverb, Consistency of tenses,</li> <li>● Paragraph Writing: Methods, unity and coherence</li> <li>● Reading Skills: Types, Strategies, Barriers,</li> </ul>	<i>Technical Communication-Principles and Practices</i> by Meenakshi Raman & Sangeeta Sharma			
21-30	III	<ul style="list-style-type: none"> <li>● Official Communication: Letter, Memo, Agenda and Minutes of meeting, notice and circular, and email</li> <li>● Job Application,</li> </ul>	<i>Technical Communication-Principles and Practices</i> by Meenakshi Raman & Sangeeta Sharma			

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100



<b>Name of The Course</b>	Lab Functional English-I			
<b>Course Code</b>	FENG1002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

**Course Objectives:**

1.To acquire the knowledge of skills required for speaking and writing

**Course Outcomes:**

On completion of course student will be able to,

<b>CO1</b>	Acquire proper pronunciation skills
<b>CO2</b>	Write and read phonemic transcription.
<b>CO3</b>	Handle the software “Clear Pronunciation”

**Text Book (s)**

**Reference(s)**

1. Course Title: **Communication Skills** by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)  
[https://www.youtube.com/watch?v=cOruENyLNYI&list=PLbMVogVj5nJSZB8BV29\\_sPwwkzMTYXpaH](https://www.youtube.com/watch?v=cOruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH)
2. Course Title: **English Language for Competitive Examinations** By Prof. Aysha Iqbal (NPTEL)  
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>
3. Course Title: **Better Spoken English** by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)  
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOkQCOElxcDQrs>

<b>Weekly Schedule of Lab Activities:</b>		
<b>Week</b>	<b>Activity Name</b>	<b>Concept Note (Plan of Action)</b>
1	Introduction	All the students will be introduced, the lab activities and assessment along with giving self-introduction.
2	Extempore	The teacher will prepare a list of topics. Each student will select any one of these randomly and speak on the same.
3	Movie Review	The students will be asked to prepare a review of a movie of their own choice. The students will be evaluated on the basis their logical thinking, content, language and confidence.
4	Phonetics (Sounds)	To enhance the pronunciation skills of the students the teachers a brief introduction to phonetics and sound system will be given to the students. Along with it the students will also practice various sounds (both consonant and vowels) in RP using the software “Clear Pronunciation”.
5	Phonetics (Transcription)	The students will learn to write and read phonemic transcription. Along with this the students will prepare a register and their transcription using software “Clear Pronunciation”.
6	Practice on Clear Pronunciation	The students will practice on the software “Clear Pronunciation” so as to revise what they learnt through the exercise of week 4 and 5.
7	Practice on Tense Buster	To hone their writing skills the students will practice on the software “Tense Buster”. The Students will learn about common mistakes and how to avoid them.
8	Role Play	It will be a group activity and the students will choose a scene from a drama given by the teacher and enact the same.
9 & 10	Group Discussion	The teacher will assign one topic to each group. The students will discuss on the same and will be evaluated based on their subject knowledge, promptness, rationality, confidence, etc.
11 & 12	Group Presentation by Students	The teacher will assign one topic to each group. The students will deliver a group presentation on the same topic and will be evaluated based on their PowerPoint, content, presentation skills, time management, etc.

### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	General Anatomy – II			
<b>Course Code</b>	BMLT2001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1 To develop the knowledge about anatomy of cardiovascular system , circulation of blood in human body.
- 2 To gain the knowledge of anatomy of Pharynx,Larynx, Trachea, Tracheobronchial tree, lungs & pleura.
- 3 To gain the knowledge of anatomy of Meninges, Brain, Cerebrum, Diencephalon, Thalamus, Hypothalamus, Cerebellum, Spinal cord,& Spinal nerves.
- 4 To know the anatomy of Male and Female reproductive system.
- 5 To gain the knowledge of anatomy of Skin, Hair, Sweat glands.

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	Demonstrate heart anatomy circulation of blood in human body
<b>CO2</b>	Describe and teach anatomy of respiratory organs
<b>CO3</b>	Demonstrate the anatomy of Nervous system
<b>CO4</b>	Describe and teach anatomy of reproductive system & Perform Pregnancy test
<b>CO5</b>	Demonstrate the anatomy of Special sense organs

### Text Book (s)

1. Text book of Anatomy & Physiology by P.R Ashalatha
2. Text book of Anatomy & Physiology by Ross & Willson

### Reference Book (s)

1. Text Book of Anatomy by Chaurasya
2. Anatomy Review by Gray's

<b>Unit-1 Cardiovascular system</b>	<b>6 hours</b>
Systemic circulation, Pulmonary circulation, Heart chambers, Blood supply of Brain, Heart , Aorta	
<b>Unit-2 Respiratory system</b>	<b>8 hours</b>
Nose, paranasal air sinuses, Pharynx larynx, Trachea, Tracheobronchial tree, lungs & pleura	
<b>Unit-3 Nervous system</b>	<b>14 hours</b>
Meninges, Brain, Cerebrum, Internal capsule, Basal Nuclei, Functional areas of cerebral cortex, Diencephalon, Thalamus, Hypothalamus, pons, Brainstem, Mid brain, Cerebellum, Spinal cord, Cranial nerves & Spinal nerves	
<b>Unit-4 Reproductive system</b>	<b>8 hours</b>
Female reproductive System: Ovaries, fallopian tubes & Uterus. Male reproductive system: Testes, vas deferens, Seminal vesicles, Prostate gland, Penis	
<b>Unit-5 Special Senses</b>	<b>3 hours</b>
Skin, Hair, Sweat Glands	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Internal (CAT 1 & CAT 2)	External (ETE)	Total Marks
10	30	60	100

<b>Name of The Course</b>	General Physiology – II			
<b>Course Code</b>	BMLT2002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1 To learn about physiology of Cardiovascular system, Heart sounds, Cardiac cycle, ECG, Cardiac output.
- 2 To gain the knowledge of Respiratory system, Tracheobronchial tree, lungs & pleura.
- 3 To gain the knowledge Nervous system , female and male Reproductive system.

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	Demonstrate heart function and circulation of blood in human body
<b>CO2</b>	Teach Functions of respiratory organs
<b>CO3</b>	Demonstrate the functions of Nervous system
<b>CO4</b>	Teach reproductive system & Perform Pregnancy test and explain Fertility control
<b>CO5</b>	Demonstrate the functions of Special sense organs

### Text Book (s)

1. Text book of Medical Physiology by Sembulingam & Prema Sembulingam
2. Text of Anatomy & Physiology by Ross & Willson

### Reference Book (s)

1. Review on Medical Physiology by Ganog's
2. Understanding Medical Physiology by RL Bijlani

<b>Unit-1 Cardiovascular system</b>	<b>8 hours</b>
Heart sounds, Cardiac cycle, ECG, Cardiac output, Heart rate, Arterial pulse, foetal circulation & Respiration, & Haemorrhage	
<b>Unit-2 Respiratory system</b>	<b>5 hours</b>
Pulmonary circulation, Exchange of respiratory gases, Transport of respiratory gases, Regulation of Respiration & Artificial respiration.	
<b>Unit-3 Nervous system</b>	<b>11 hours</b>
Neuron, Classification of nerve fibres, Neuroglia, Receptors, Synapse, Spinal cord, Brainstem, Thalamus, Internal capsule, Hypothalamus, Basal Ganglia, Cerebellum, EEG, CSF & Epilepsy	
<b>Unit-4 Reproductive system</b>	<b>10 hours</b>
Male reproductive system: Seminal vesicles, Prostate gland, Semen. Female Reproductive system: Ovary, Menstrual cycle, Ovulation, Menopause, Infertility, Pregnancy, Pregnancy tests & Fertility control	
<b>Unit-5 Special Senses</b>	<b>6 hours</b>
sensation of taste, smell, Auditory pathway, Visual pathway, Field of vision & Errors of refraction	

#### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Internal (CAT 1 &amp; CAT 2)</b>	<b>External (ETE)</b>	<b>Total Marks</b>
10	30	60	100

<b>Name of The Course</b>	Biochemical Metabolism			
<b>Course Code</b>	BMLT2003			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1 To learn the biochemical Metabolism of various biomolecules and their integration .

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	Describe and outline carbohydrate metabolism
<b>CO2</b>	Describe and outline Lipid metabolism
<b>CO3</b>	Discuss on protein metabolism
<b>CO4</b>	Discuss on Nucleotide metabolism
<b>CO5</b>	Present outline on integrated biochemical metabolism

### Text Book (s)

1. Biochemistry by U.Satyanarayana
2. Test Clinical Chemistry

### Reference Book (s)

1. Kaplan, Clinical Chemistry
2. Varley, Clinical Chemistry

<b>Unit-1 Carbohydrates Metabolism</b>	<b>8 hours</b>
Introduction, Glycolysis, Citric acid Cycle, Gluconeogenesis, Glycogen metabolism, Glycogenolysis, HMP Shunt pathway.	
<b>Unit-2 Lipids Metabolism</b>	<b>8 hours</b>
Introduction , fatty acid oxidation, ketone bodies, Biosynthesis of fatty acids, Synthesis of triacylglycerol's, Metabolism of phospholipids, Glycolipids, Cholesterol, Lipoproteins, Fatty liver, Atherosclerosis.	
<b>Unit-3 Proteins Metabolism</b>	<b>8 hours</b>
Amino acid pool, Transamination, Deamination, Metabolism of ammonia, Ure cycle, Phenyl alanine & tyrosine	
<b>Unit-4 Nucleic Acid Metabolism</b>	<b>8 hours</b>
Biosynthesis of purine nucleotides, Degradation of purine nucleotides, Disorders of purine metabolism, Biosynthesis of Pyrimidine nucleotides, Degradation of Pyrimidine nucleotides & Disorders of pyrimidine metabolism	
<b>Unit-5 Integration of Metabolism</b>	<b>8 hours</b>
Introduction, Organ specialization & metabolic integration, Metabolism in starvation and dehydration	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Internal (CAT 1 & CAT 2)	External (ETE)	Total Marks
10	30	60	100



<b>Name of The Course</b>	General Microbiology			
<b>Course Code</b>	BMLT2004			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1 To learn the history & Basics of General Microbiology, Sterilization Methods, Bacterial growth.
- 2 To gain the knowledge of different types of culture media used for the growth of Bacteria & Bacterial genetics.

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	Practice different types of microbiology staining methods & Demonstrate the Microorganisms using Microscope
<b>CO2</b>	Illustrate & Practice the different types of sterilization
<b>CO3</b>	Demonstrate the Growth Curve of a Bacteria in culture
<b>CO4</b>	Practice different types of Streaking techniques & Preparation of media for microbial culture
<b>CO5</b>	Apply the knowledge acquired to explain briefly about Bacterial genome, Mutation & Its Repair

### Text Book (s)

1. Aneja K.R. Experiments in Microbiology
2. Gunasekaran P, Lab Manual of Microbiology, New Age Publishers
3. Text book of Microbiology by Prescott
4. Text book of Microbiology by Ananthanarayan

### Reference Book (s)

1. Practical Medical Microbiology by Mackie and MacCartney
2. Medical Microbiology by Paniker & Satish Gupte

3. Medical laboratory Technology vol.I ,II, III by Mukherjee
4. District Laboratory Practice in tropical countries Vol II Microbiology by Monia Cheesbrough

<b>Unit-1 Introduction to Medical Microbiology &amp; Microscopy</b>	<b>8 hours</b>
Definition - History - Host-Microbe relationships. Microscopy- Introduction and history, Types of microscopes; Light microscope, Fluorescent, Phase contrast, Electron microscope. General characteristics & classification of Microbes, Prokaryotes & Eukaryotes, Morphological classification of bacteria, Bacterial anatomy (Bacterial cell structures)	
<b>Unit-2 Sterilization</b>	<b>8 hours</b>
Definition, Principles & Types of sterilization -Physical methods, Chemical methods	
<b>Unit-3 Growth and Nutrition of Microbes</b>	<b>8 hours</b>
General nutritional & other requirements of the bacteria, Classification of bacteria on the basis of their nutritional requirements, Physical conditions required for growth., Normal growth cycle of bacteria (growth curve) Types of microbial cultures: Synchronous, Static, continuous culture.	
<b>Unit-4 Culture media &amp; Streaking techniques</b>	<b>8 hours</b>
Introduction, Classification, Composition, & types of culture media Example & Uses. Antibiotic sensitivity Test. Aerobic & anaerobic culture methods	
<b>Unit-5 Microbial genetics</b>	<b>8 hours</b>
Bacterial genomes and basic functions; Microbial Replication, transcription and translation; microbial gene organization and Operon; Plasmid; Transduction; Transposition; Transformation; Conjugation; DNA Mutation and DNA Repair.	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Internal (CAT 1 & CAT 2)	External (ETE)	Total Marks
10	30	60	100

<b>Name of The Course</b>	General Microbiology Lab			
<b>Course Code</b>	BMLT2051			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

- 1 To practice the practical knowledge in Handling of Compound microscope.
- 2 To learn the different methods of Sterilization.
- 3 To prepare different culture media.
- 4 To identify motile and non-motile organisms via hanging drop technique .

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	Practice General Microbiology procedures
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### Text Book (s)

1. Text book of Microbiology by Ananthanarayan
2. Gunasekaran P, Lab Manual of Microbiology, New Age Publishers

### Reference Book (s)

1. Practical Medical Microbiology by Mackie and MacCartney
2. Text book of Microbiology by Prescott

### List of Experiments

1. Demonstration of safe code of practice for a Microbiology laboratory
2. Demonstration of working & handling of Compound microscope
3. Prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
4. Demonstration of method of sterilization by autoclave
5. Demonstration of method of sterilization by hot air oven.
6. Demonstration of streaking methods.
7. Demonstration of Hanging drop technique
8. Demonstration of Albert Stain
9. Demonstration of Gram Stain
10. Demonstration Indian ink stain

### Continuous Assessment Pattern

Internal (CAT I & CAT II)	External (ETE)	Total Marks
30	70	100

<b>Name of The Course</b>	Biochemical Metabolism Lab			
<b>Course Code</b>	BMLT2052			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

- 1 To learn the basic tests performed in biochemistry.
- 2 To gain the knowledge of estimating different Biochemical tests procedures and their interpretation.

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	Perform basic tests of Biochemistry
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### Text Book (s)

1. Text book of Medical Biochemistry by Chaterjee Shinde
2. Manipal manual of Biochemistry by S.Naik

### Reference Book (s)

- 1 Medical laboratory technology book by Ramkin soodh
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### List of Experiments

1	Good laboratory practices in analytical biochemistry laboratory
2	Determination of Glucose in serum & plasma
3	Determination of Blood urea
4	Determination of Serum Creatinine
5	Determination of Serum Cholesterol
6	Determination of serum Transaminases
7	Demonstration of principle & procedure of Gas chromatography
8	Determination of A:G ratio

### Continuous Assessment Pattern

<b>Internal (CAT I &amp; CAT II)</b>	<b>External (ETE)</b>	<b>Total Marks</b>
30	70	100



<b>Name of The Course</b>	Functional English II			
<b>Course Code</b>	FENG1003			
<b>Prerequisite</b>	Standing of the basics of English language, pronunciation and technical as well as academic writing.			
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Objectives:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

### Course Outcomes

On the successful completion of the course, the student would be able to:

<b>CO1</b>	Develop the understanding into the communication and language as its medium
<b>CO2</b>	Develop the basic understanding of spoken English
<b>CO3</b>	Improve their reading fluency skills through extensive reading
<b>CO4</b>	Use and assess information from academic sources, distinguishing between main ideas and details
<b>CO5</b>	Compare and use a range official support through formal and informal writings

### Reference :

1. Course Title: **Communication Skills** by Dr. T. Ravichandran, Department of Humanities and Social Sciences (NPTEL)  
[https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29\\_sPwwkzMTYXpaH](https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH)
2. Course Title: **English Language for Competitive Examinations** By Prof. Aysha Iqbal (NPTEL).  
<https://www.youtube.com/watch?v=6xFaxIwwq0s&list=PLqGm0yRYwTjSdCmTeXLJLJkHXmC6CbEw>



**Unit-1**

- Technical Writing: Meaning, Types, Style, Features.
- Report: Types, Format, Structure, Citation, Planning and writing, Project report

Manual and user guide: general layout, planning and writing .

**Unit-2**

- Proposal: Types, format, structure, planning and writing
- Listening vs Hearing, Steps and Types of listening; Barriers of Listening, Methods to improve listening

Group Discussion

**Unit-3**

- Spelling and Phonetic Inconsistencies in English
- Basics of Pronunciation, Organs of speech, articulation, Introduction to Sounds (IPA)
- Phonetic/Phonemic Transcription

Presentation Strategies: Purpose, Audience and locale analysis, Non-verbal aspects, voice and pronunciation, effective PowerPoint preparation.

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
20	10	70	100

<b>Name of The Course</b>	Lab Functional English-II			
<b>Course Code</b>	FENG1004			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### Course Objectives:

The objective of the course is to:

1. Understand simple texts and a range of high frequency vocabulary in context
2. Describe aspects of personal and everyday life in both oral and written form
3. Produce short and simple connected texts on familiar topics
4. Basic understanding into pronunciation of English sounds

### Course Outcomes

On the successful completion of the course, the student would be able to:

1. Develop the understanding into the communication and language as its medium
2. Develop the basic understanding of spoken English
3. Improve their reading fluency skills through extensive reading
4. Use and assess information from academic sources, distinguishing between main ideas and details
5. Compare and use a range official support through formal and informal writings

### Reference:

- 1 Course Title: **Better Spoken English** by Prof. Shreesh Chaudhary, Department of Humanities and Social Sciences, IIT Madras. (NPTEL)  
<https://www.youtube.com/watch?v=0AM35Nu5McY&list=PLbMVogVj5nJT3a24lj4KOkQCOElxcD>
- Ors
- 2 Course Title: **Understanding Creativity and Creative Writing** by Prof. Neelima Talwar(NPTEL)  
<http://www.digimat.in/nptel/courses/video/109101017/L01.html>

**The following activities will be conducted in lab classes:**

1. Spin-a-yarn
2. Drafting Catchphrases
3. Picture Interpretation (Denotation and Connotation)
4. Active Listening
5. Reading between the lines
6. Brief Biography of Female Personalities
7. Rhythm and Intonation
8. Public Speaking
9. Mock Lecture
10. Dialogue Writing
11. Enacting scene(s) from critically appreciated movies.

Weekly Schedule of Lab Activities:		
Week	Activity Name	Concept Note (Plan of Action)
1	Spin-a-yarn	This will be an ice breaking session. The students will be given the beginning lines of an imaginary story and will be asked to carry on the same by adding two-three sentences at a time one by one to reach a meaningful end of the story.
2	Drafting Catchphrases	Each student will be individually called and given a random topic regarding any advertisement. They will be asked to draft catchphrases for the same within a short time period (1-2 min.).
3	Picture Interpretation	Students will be asked to review a random picture with the help of denotative meanings and their connotative implications.
4	Active Listening	An audio clip (BBC News) will be played by the teacher in the class. Students will be given an incomplete written draft of the same. They will be asked to carefully listen to the audio clip and fill the blanks.
5	Reading between the lines	A Media Discourse (Public speech by a politician) will be presented to the students. Students will be asked to excavate the hidden messages and prepare a list of what the speech explores.
6	Brief Biography of Female Personalities	Students will be asked to write a brief biography of any female personality highlighting her achievements and notable moments of her life.

7	Word Accent, Rhythm and Intonation	With the help of the software Clear pronunciation, students will be able to overcome Mother Tongue Influence (MTI) by learning various Rhythm patterns and Intonation at sentence level.
8	Public Speaking	To enhance their confidence, students will be given a chance to prepare a topic of their choice and speak in front of the class.
10	Mock Lecture	Students will be asked to Prepare a Mock Lecture so as to make them through with the concepts and ready to face the professional world.
11	Dialogue Writing	The teacher will assign one scene to each group. Students then will be asked to use their imagination to write dialogues.
12	Enacting Scene(s) from Critically appreciated Movie (English)	It will be a group activity and the students will choose a scene from a movie given by the teacher and enact the same.

#### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Systemic Bacteriology			
<b>Course Code</b>	BMLT3001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To learn about the gram stain to differentiate bacteria.
2. To develop the brief knowledge of gram positive and negative infections.
3. To know about the diagnosis of mycobacterium.
4. To know about the diagnosis of spirochaetes and methods for collection of different sample.

### Course Outcomes

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

<b>CO1</b>	Identify and diagnosis of Staphylococci, streptococci and Neisseria in the laboratory.
<b>CO2</b>	Apply knowledge on pathogenesis and lab diagnosis of Enterobacteriaceae, anthrax and clostridium
<b>CO3</b>	Analyze clinical specimen to diagnose Mycobacterium tuberculosis and Leprae in the laboratory.
<b>CO4</b>	Apply knowledge on diagnosis and treatment of spirochaetes infections.
<b>CO5</b>	Explain laboratory diagnosis and treatment of Miscellaneous bacteria.
<b>CO6</b>	Discuss and perform Clinical sample collection and knowledge on recent technology in the bacteriology lab

### Text Book (s)

- 1 Aneja K.R. Experiments in Microbiology
- 2 Gunasekaran P, Lab Manual of Microbiology, New Age Publishers
- 3 Text book of Microbiology by Prescott
- 4 Text book of Microbiology by Ananthanarayan

### Reference Book (s)

- 1 Practical Medical Microbiology by Mackie and Mac Cartney

- 2 Text book of Microbiology by Ananthanarayan
- 3 Medical Microbiology by Paniker & Satish Gupte
- 4 Medical laboratory Technology vol.I ,II, III by Mukherjee
- 5 Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

<b>Unit-1 Cocci</b>	<b>5 hours</b>
Staphylococci, Streptococci, Neisseria, Pneumococcus	
<b>Unit-2 Bacilli</b>	<b>10 hours</b>
Anthrax, Diphtheria, Clostridium species Enterobacteriaceae, Vibrios, Brucella	
<b>Unit-3 Micobacterium</b>	<b>9 hours</b>
Haemophilus, TB, Leprosy, AFB stain	
<b>Unit-4 Spirochaetes</b>	<b>12 hours</b>
Brucella, Leptospira, Borella, Treponema	
<b>Unit-5 Miscellaneous</b>	<b>9 hours</b>
Corynebacterium, pseudomonas, bordetella, Miscellaneous bacteria	
<b>Unit-6 Recent Techniques</b>	<b>8 hours</b>
Specimen collection from different areas from the human body for bacterial diagnosis Advance instrument used in Bacteriology: CMIA, fluorogenic method, BacT Alert 3D system	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Pathology			
<b>Course Code</b>	BMLT3002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about various types of cell abnormalities and death.
2. To gain the basic knowledge of clinical pathology.
3. To learn examination of various body fluids in pathology lab.
4. To gain the knowledge of tissue processing, section cutting, staining of histopathological tissues.

### Course Outcomes

On completion of this course, the students will be able to:

<b>CO1</b>	Recall on introduction to pathology
<b>CO2</b>	Examine semen, sputum and urine examination in Clinical pathology laboratory
<b>CO3</b>	Examine body fluids, Transudate, Exudate and do cell count techniques.
<b>CO4</b>	Simplify the reception, receiving, sample fixation and grossing of histological specimens in histopathology laboratory
<b>CO5</b>	Distungish the tissue processing and section cutting in histopathology laboratory
<b>CO6</b>	Develop knowledge of Automation in histopathology and immunohistochemistry

### Text Book (s)

- 1 Hand book of Pathology by Harshmohan
- 2 Practical Hematology by Davies & Lewis

### Reference Book (s)

- 1 Handbook of Histopathological Techniques by C F A Culling
- 2 Medical Lab technology by Lynch
- 3 An Introduction to Medical Lab Technology by F J Baker and Silverton

4 Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft  
Clinical Diagnosis in lab methods by Todd & Sanford

<b>Unit-1 Introduction of Pathology</b>	<b>5 hours</b>
Introduction to Pathology, Normal Cell injury and cell death, Basic mechanisms involved in the process of inflammation and repair, Alternations in Vascular permeability and blood flow, migration of WBC's mediators of Inflammation	
<b>Unit-2 Clinical Pathology</b>	<b>10 hours</b>
Clinical Pathology: Introduction, Urine Physical, Chemical & Microscopic examination, Semen total count, Morphology & clinical abnormalities, Examination of feces for occult blood. physical examination of sputum	
<b>Unit-3 Body fluids abnormalities</b>	<b>9 hours</b>
Examination of body fluids: Transudate, Exudate & Cell counts methods	
<b>Unit-4 Histopathology</b>	<b>12 hours</b>
Histopathology: Introduction, Reception of specimens, & Various fixatives-Mode of action, indications, Preparation. Grossing techniques	
<b>Unit-5 Tissue processing and embedding</b>	<b>9 hours</b>
Steps of tissue processing and embedding, Section cutting, Decalcification. Mounting & Staining of Slides. Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications.	
<b>Unit-6 Introduction to Automation in histopathology</b>	
Introduction to Automation in histopathology, histokinette tissue processor, Automatic microtome, automated slide stainer and coverslipper, introduction to Immunohistochemistry, positive control and negative control in stain .	

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100



<b>Name of The Course</b>	Analytical Biochemistry			
<b>Course Code</b>	BMLT3003			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about various types of acid base balance in human body
2. To gain the knowledge how to calculate and prepare various solutions
3. To learn the working and application of photometry
4. To know the working and application of various types of chromatography techniques.
5. To gain the knowledge of different types of electrophoresis.

### Course Outcomes

On completion of this course, the students will be able to:

<b>CO1</b>	Recall on Acid-base balance in the Human body.
<b>CO2</b>	Make use and prepare solutions of required concentration.
<b>CO3</b>	Explain the function and maintenance of the instruments used in photometry
<b>CO4</b>	Compare and simplify the different types of chromatography.
<b>CO5</b>	Justify and distinguish the different types of Electrophoresis.
<b>CO6</b>	Discuss the theory based on advance technique CRISPER.

### Text Book (s)

- 1 Text book of Biochemistry by U. Satyanarayana & U. Chakrapani
- 2 Manipal Manual of Biochemistry by B. Shivanand Nayak
- 3 Wilson & Walkar's Principles and techniques of Biochemistry and Molecular Biology by Andreas Hofmann

### Reference Book (s)

- 1 Practical Clinical Biochemistry by Harold Varley
- 2 Medical Laboratory Technology by Mukherjee

<b>Unit-1 Acid base balance</b>	<b>5 hours</b>
Acid base balance -Concept of pH, Henderson Hasse balch equation, buffers & Buffering mechanism	
<b>Unit-2 Concept of Stoichiometry</b>	<b>9 hours</b>
Concept of Stoichiometry: Molarity, Molality, Normality, Gram Equivalent Weight, Preparation of solutions.	
<b>Unit-3</b>	<b>8 hours</b>
Colorimeter, Spectrophotometer, Nephelometry, Turbidometry, Flame Emission Spectroscopy	
<b>Unit-4</b>	<b>10 hours</b>
Chromatography: Introduction, Types of chromatography, Paper Chromatography, Thin layer chromatography: Column chromatography: Gas chromatography: Ion exchange chromatography:	
<b>Unit-5</b>	<b>8 hours</b>
Electrophoresis: Introduction, Principle, Types of electrophoresis PAGE & SDS-PAGE, applications	
<b>Unit-6</b>	<b>8 hours</b>
Recent boost up techniques (CRISPR): Introduction, History, classification of CRISPR, CRISPR Cas9, Mechanism, biological structure, Application.	

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Laboratory Quality Management-I			
<b>Course Code</b>	BMLT3004			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	2	0	0	2

### Course Objectives:

1. To develop the knowledge about various types of Quality control management in lab
2. To gain the knowledge of about the safety and emergency systems in clinical lab
3. To learn how to run sample in clinical lab with quality.
4. To know the functions of quantitation process in lab
5. To gain the knowledge of how to differentiate between qualitative and semi-quantitative procedures

### Course Outcomes

**On completion of course student will be able to,**

<b>CO1</b>	Illustrate the basic concept of laboratory quality management and its importance
<b>CO2</b>	Plan a model laboratory and apply knowledge in laboratory safety, first aid and emergency systems
<b>CO3</b>	Apply knowledge on quality control sample preparation, sample collection, storage, transportation
<b>CO4</b>	Analyze quality control samples for quantitation process and interpret quality control data
<b>CO5</b>	Explain quality control charts its significance and how to maintain quality

### Text Book (s)

- 1 ICMR(2008) guidelines for good clinical laboratory practices.
- 2 Hospital waste Management : Chapter 13 ,PARK'S Textbook of Preventive and Social Medicine, 18th Edition
- 3 Manual of Biochemistry by Shivanad nayak by Jaypee publications

### Reference Book (s)

- 1 NIH :DIADS guidelines for Good Clinical Laboratory Practice Standerds,2011
- 2 WHO : Good Clinical Laboratory Practice (GCLP),2009

<b>Unit-1 Introduction to Quality control</b>	<b>6 hours</b>
Goals and objectives- Total quality management framework- Quality laboratory processes-Quality assurance, Quality assessment, Quality control, Quality planning and Quality improvement	
<b>Unit-2 Facilities and safety</b>	<b>6 hours</b>
Laboratory design- Physical aspects of premises and rooms –safety management programme- personal protective equipment- emergency management and first aid	
<b>Unit-3 Process control-sample management</b>	<b>6 hours</b>
Sample Collection and preservation-Sample processing- Sample storage-retention and disposal- Sample transport	
<b>Unit-4 Process control-quality control for quantitation</b>	<b>6 hours</b>
Control materials-establishing the value range for the control material-Control ranges-interpretating quality control data	
<b>Unit-5 Process control -quality control for qualitative and semi quantitative procedures</b>	<b>6 hours</b>
Preparation of internal `control`-Pooled Serum- Quality control charts, Levy- Jennings and Cusum charts	

#### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Infection Control & Prevention-I			
<b>Course Code</b>	BMLT3005			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	2	0	0	2

### Course Objectives:

1. To develop the knowledge about various types of guidelines for infection control
2. To gain the knowledge of spreading and control of infection in lab
3. To learn the different style of working in lab to minimise the exposure of infectious material
4. To know the importance of PPE for worker in healthcare sector
5. To gain the knowledge of sterilization and uses of disinfection by various method

### Course Outcomes

**On completion of course student will be able to,**

<b>CO1</b>	Practice and teach Standards of care in infection prevention and Guidelines for Infection Control in emergency settings
<b>CO2</b>	Apply knowledge in Transmission and control of infection in health care settings
<b>CO3</b>	Apply knowledge in practice and use of engineering and work practice controls to reduce the opportunity for patient and healthcare worker exposure to potentially infectious material in all healthcare settings
<b>CO4</b>	Select and use of barriers and/or personal protective equipment for preventing patient and healthcare worker contact with potentially infectious material
<b>CO5</b>	Apply knowledge in principles and practices for cleaning, disinfection, and sterilization

### Text Book (s)

- 1 ICMR(2008) guidelines for good clinical laboratory practices.
- 2 Hospital waste Management : Chapter 13 ,PARK'S Textbook of Preventive and Social Medicine,18th Edition

### Reference Book (s)

- 1 NIH :DIADS guidelines for Good Clinical Laboratory Practice Standerds,2011

2 WHO : Good Clinical Laboratory Practice (GCLP),2009

<b>Unit-1 Professional Responsibility for Infection Prevention</b>	<b>6 hours</b>
Standards of care in infection prevention -Guidelines for Infection Control in emergency Settings	
<b>Unit-2 Transmission and control of infection in health care sett</b>	<b>6 hours</b>
Transmission of infections - Prevention: Breaking the “Chain of Transmission”	
<b>Unit-3</b>	<b>6 hours</b>
Use of engineering and work practice controls to reduce the opportunity for patient and healthcare worker exposure to potentially infectious material in all healthcare settings	
High risk practices and procedures (by exposure type) capable of causing healthcare acquired infection with blood borne pathogens-Safe injection practices and procedures designed to prevent disease transmission from patient to patient and healthcare worker to patient-	
Evaluation/Surveillance of exposure incidents -Engineering controls -Work practice controls	
<b>Unit-4</b>	<b>6 hours</b>
Selection and use of barriers and/or personal protective equipment for preventing patient and healthcare worker contact with potentially infectious material	
Types of PPE and barriers and criteria for selection-Choosing PPE based on reasonably anticipate interaction-Choosing	
barriers / PPE based on intended need-Guidance on proper utilization of PPE / barriers	
<b>Unit-5 Principles and practices for cleaning, disinfection, and Sterilization</b>	<b>6 hours</b>
General Information-Potential for Contamination -Factors that have contributed to contamination - Points to reprocessing or handling where breaks in infection prevention practices can compromise the integrity of the equipment of devices- Sterilization Methods Advantages and Disadvantages	

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	<b>COMPUTER FUNDAMENTALS</b>			
<b>Course Code</b>	<b>COMP1111</b>			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Ant requisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### Course Objective:

The students will be able to appreciate the role of computer technology and some extent able to gain hand-on experience in using computers.

The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

### Course Outcomes

At the end of the course, students will be able to:

<b>CO1</b>	Students should be able to gain hand-on experience in using computers
<b>CO2</b>	Students should be able to understand the concept of storage devices.
<b>CO3</b>	Students should get the basic knowledge about MS Word and MS Excel.
<b>CO4</b>	Students should able to understand the Concept of PowerPoint and Operating System.
<b>CO5</b>	Students should able to utilise knowledge of Internet and its application.
<b>CO6</b>	Use different data and create / manipulate basic data files and developing applications for real world problems.

### Text Books

- 1 Computer Technology. Joney & Bartlett learning, 2014

### Reference Books

- 1 Computers fundamentals, Lippincott Williams and Wilkins,1991

## Course Content

<b>Unit I Introduction</b> <b>hours</b>	<b>8</b>
Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.	
2. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).	
3. Processor and memory: The Central Processing Unit (CPU), main memory.	
<b>Unit II: Introduction to Storage Device</b>	<b>8 hours</b>
Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.	
5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).	
<b>Unit III: Introduction to MS-Word</b>	<b>8 hours</b>
Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.	
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.	
<b>Unit IV : Introduction to power-point:</b> <b>hours</b>	<b>8</b>
Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.	
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.	
10. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network	
<b>Unit V: Internet and its Applications</b>	<b>8 hours</b>



Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

12. Application of Computers in clinical settings.

**Unit VI: Advances and the Latest Trends**  
**hours**

**9 Lecture**

The advances and the latest trends in the course as well as the latest applications of the areas covered in the course.

The latest research conducted in the areas covered in the course.

Discussion of some latest papers published in IEEE transactions and ACM transactions, Web of Science and SCOPUS indexed journals as well as high impact factor conferences as well as symposiums.

Discussion on some of the latest products available in the market based on the areas covered in the course and patents filed in the areas covered in the course

**COURSE PLAN:** (Total: 15 hours) – students will be given hand-on practical sessions and reading materials (softcopy). Some of the topics will be demonstration.

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).
6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.
10. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
12. Application of Computers in clinical settings.

#### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
<b>10</b>	<b>20</b>	<b>70</b>	<b>100</b>

<b>Name of The Course</b>	<b>COMPUTER FANDAMENTALS LAB</b>			
<b>Course Code</b>	<b>COMP1112</b>			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objective:

The objective of the course is to:

The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

### Course Outcomes

At the end of the course, students will be able to:

<b>CO1</b>	The students will be able to understand the basics of computer.
<b>CO2</b>	The students will be able to understand Input and Output devices.
<b>CO3</b>	The students will be able to understand the concept of storage devices
<b>CO4</b>	The students will be able to understand MS-Word application
<b>CO5</b>	The students will be able to understand Power-Point application.
<b>CO6</b>	The students will be able to understand the usage of Internet and its application.

### Text Books

- 1 Computer Technology. Joney & Bartlett learning, 2014

### Reference Books

- 1 Computers fundamentals, Lippincott Williams and Wilkins,1991

### List of Experiments

- 1 Introduction to computer:
- 2 Introduction to . Input output devices
- 3 Introduction to Storage Devices:
- 4 Introduction to MS-Word
- 5 Introduction to power-point
- 6 Introduction to Internet and its Applications

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
<b>30</b>	<b>70</b>	<b>100</b>

<b>Name of The Course</b>	Analytical Biochemistry Lab			
<b>Course Code</b>	BMLT3051			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge about preparation of different concentration of solution
2. To gain the knowledge of working and practical exposure on colorimeter and spectrophotometer
3. To learn the working of different types of chromatography

### Course Outcomes

On completion of course student will be able to:

<b>CO1</b>	perform preparation of reagents in any concentration & Perform biomedical techniques
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### Text Book (s)

- 1 Practical Clinical Biochemistry by Harold Varley
- 2 Text book of Medical Laboratory Technology by P. B. Godker
- 3 Medical Laboratory Technology by Mukherjee
- 4 Manipal Manual of Biochemistry by Shivanand Nayak B

### Reference Book (s)

- 1 Text book of Medical Biochemistry by Chaterjee Shinde
- 2 Principal of Biochemistry by Lehninger
- 3 Biochemistry by Stryer

<b>List of Experiments</b>	
1	Good laboratory practices
2	Preparation of Molar solutions
3	Preparation of Normal Solutions
4	Preparation of Molal solutions
5	Demonstration of principle, working & maintenance of spectrophotometer
6	Demonstration of principle, working & maintenance of colorimeter
7	Demonstration of principle, working & maintenance of flame photometer
8	Demonstration of principle, procedure of paper chromatography
9	Demonstration of principle & procedure of column chromatography
10	Demonstration of principle & procedure of Electrophoresis

#### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Pathology Lab			
<b>Course Code</b>	BMLT3052			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge about tests to examine body fluids
2. To perform semen count and its morphology
3. To learn and perform tissue processing and various stains used in histopathology.

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Analyze the different clinical pathology samples like body fluids, urine, feces, sputum.
<b>CO2</b>	Test the count and morphology of semen.
<b>CO3</b>	Examine the histopathological sample processing and staining.

### Text Book (s)

- 1 Hand book of Pathology by Harshmohan
- 2 Practical Hematology by Davies & Lewis

### Reference Book (s)

- 1 Handbook of Histopathological Techniques by C F A Culling
- 2 Medical Lab technology by Lynch
- 3 An Introduction to Medical Lab Technology by F J Baker and Silverton
- 4 Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

<b>List of Experiments</b>	
1	Physical and microscopic examination of urine
2	Physical examination of Sputum.
3	Physical examination of Faeces
4	Test for Occult Blood
5	Demonstration of physical examination of semen
6	Demonstration of total count of Semen
7	Demonstration of semen morphology
8	Reception and labelling of histological specimens
9	Preparation of various fixatives, Zenker's fluid, Bouin's fluid , Corney's fluid , 10% Neutral formalin, Formal acetic acid
10	Preparation of ascending and descending grades of alcohol from absolute alcohol
11	Tissue processing by manual and automated processor method
12	Demonstration of microtome & types of microtome
13	Demonstration of Honing and stropping technique
14	Demonstration of section cutting, Preparation of slides.
15	Demonstration & practice of the Haematoxylin and Eosin staining technique and mounting

#### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Systemic Bacteriology Lab			
<b>Course Code</b>	BMLT3053			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

2. To develop the skills to identify and perform sensitivity test on bacteria
2. To gain the knowledge to perform and identification of mycobacterium
3. To learn the various biochemical test to identify type of species.

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Perform identification of bacteria and sensitivity test for Bacterial species.
<b>CO2</b>	Perform identification of mycobacterium tuberculosis.
<b>CO3</b>	Perform various biochemical test and identified different types of bacteria species.

### Text Book (s)

- 1 Aneja K.R. Experiments in Microbiology
- 2 Gunasekaran P, Lab Mannual of Microbiology, New Age Publishers
- 3 Text book of Microbiology by Prescott
- 4 Text book of Microbiology by Ananthanarayana

### Reference Book (s)

- 1 Practical Medical Microbiology by Mackie and MacCartney
- 2 Text book of Microbiology by Ananthanarayana
- 3 Medical Microbiology by Paniker & Satish Gupta



<b>List of Experiments</b>	
1	Demonstration of Gram stain
2	Demonstration of ZN staining
3	Demonstration of Capsule staining
4	Demonstration of Hanging drop technique
5	Demonstration of Biochemical tests
6	Demonstration of AST (Disc diffusion method)

### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Hematology & Hematological diseases			
<b>Course Code</b>	BMLT4001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about blood cell production and cell counts
2. To gain the knowledge of red blood cell disorder.
3. To gain the knowledge of white blood cell disorder.
4. To know the coagulation disorder
5. To gain the knowledge of various types of anticoagulants

### Course Outcomes

On completion of this course, the students will be able to:

<b>CO1</b>	Apply basic knowledge in blood cell production and perform identification of blood cell and cell counts
<b>CO2</b>	Apply Basic knowledge on different types of anaemia's .
<b>CO3</b>	Illustrate white blood cell disorder and perform general procedure in hematology.
<b>CO4</b>	Describe/diagnose about coagulation disorder in human.
<b>CO5</b>	Explain about different types of anticoagulant used in hematology laboratory.
<b>CO6</b>	Discuss newly diagnosed haematological diseases

### Text Book (s)

1. Text book of Medical Laboratory Technology by Paraful B. Godkar
2. Practical Haematology by JB Dacie
3. Medical laboratory Technology by KL Mukherjee Volume.

### Reference Book (s)

- 1 Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry
- 2 Atlas of haematology (5th edition) by G.A. McDonald

### 3 De Gruchy's clinical haematology in medical practice

<b>Unit-1 Basic Hematology</b>	<b>5 hours</b>
Introduction of hematology, hematopoiesis, RBC, ESR, PCV, Red cell Indices.	
<b>Unit-2 Anemias</b>	<b>10 hours</b>
Classification of anemia (Morphology, Etiology), clinical features of anemia, Classification: Microcytic hypochromic anemia, Macrocytic anemia, Normocytic normochromic anemia. LE- Cell Phenomenon, Reticulocyte count	
<b>Unit-3 Leucopoiesis &amp; disorders, WBC</b>	<b>9 hours</b>
Quantitative disorders of Leukocytes Cause and significance, Infectious mononucleosis , Monocytic Disorders(AML & CML), Lymphocytic Disorders(ALL & CLL), Hodgkin's Lymphoma	
<b>Unit-4 Thrombopoiesis and its disorders</b>	<b>12 hours</b>
Introduction Causes of bleeding disorders, Vascular defect. Platelet defect, Factor deficiency, Inhibitors, Hyper fibrinolysis, Types of bleeding disorders, Inherited bleeding disorders, Acquired bleeding disorders, Thrombosis, Introduction, Causes of thrombosis	
<b>Unit-5 Anticoagulants</b>	<b>9 hours</b>
Anticoagulants used in hematology and mode of action, Steps in hematology investigation,	
<b>Unit-6 Newly diagnosed haematological diseases</b>	
Introduction of Oral disorders with Haematological diseases, stimulated salivary flow rate (SSFR); decayed, missing and filled teeth (DMFT) index.	

#### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Immunology & Bacterial serology			
<b>Course Code</b>	BMLT4002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about structure & types of Antigen and immunoglobulins
2. To gain the knowledge of Antigen-Antibody reaction
3. To gain the knowledge of the principle, procedure, interpret various serological tests
4. To know the compliment activation pathways and immune response
5. To gain the knowledge of auto immune diseases, Vaccination schedule

### Course Outcomes

On completion of this course, the students will be able to:

<b>CO1</b>	Explain the different types of immunity, immune cells, structure & types of Antigen and immunoglobulins
<b>CO2</b>	Differentiate general features ,mechanism, applications of different types of Antigen-Antibody reaction
<b>CO3</b>	Demonstrate the principle, procedure, interpret various serological tests
<b>CO4</b>	Generalize compliment activation pathways and types of immune response
<b>CO5</b>	Explain autoimmunity, auto immune diseases, Vaccination schedule
<b>CO6</b>	Modify recent advance techniques for bacterial identification.

### Text Book (s)

- 1 Text book of Microbiology by Ananthanarayan
- 2 Text book of Microbiology: C P Baveja
- 3 Text book of immunology by: S K Gupta

### Reference Book (s)

- 1 Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2

- 2 Medical Microbiology by Paniker & Satish Gupte
- 3 Medical laboratory Technology Vol. I ,II, III by Mukherjee
- 4 Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough

<b>Unit-1 Basic Immunology</b>	<b>8 hours</b>
Basic Immunology: History and introduction to immunology, Immunity; Innate & Acquired immunity- mechanisms mechanism of immunity; Definition, types of antigens and determinants of antigenicity ; Definition, types, structure and properties of immunoglobulin	
<b>Unit-2 Antigen Antibody reaction</b>	<b>10 hours</b>
Antigen Antibody reaction: Antigen-Antibody reactions-Definition, Classification, General features and mechanisms , Applications of Precipitation, Agglutination, Immunodiffusion Complement fixation test, Immuno- fluorescence, RIA , ELISA	
<b>Unit-3 Serological Tests</b>	<b>6 hours</b>
Serological Tests: Principle, procedure and interpretation of various serological tests: WIDAL, VDRL, ASO, CRP, Brucella tube agglutination, Rose-Waaler	
<b>Unit-4 Complement</b>	<b>8 hours</b>
Complement system: Definition, complement activation pathways Immune response: Introduction & Basic concepts of Humoral and Cellular immune response	
<b>Unit-5 Auto Immunity and Vaccines</b>	<b>8 hours</b>
Auto Immunity: Basic concepts of autoimmunity and brief knowledge about autoimmune diseases Vaccines: Definition, Types, Vaccination schedule	
<b>Unit-6: Advance techniques in systemic bacteriology</b>	<b>hours 8</b>
Specimen collection from different areas from the human body for bacterial diagnosis Advance instruments used in Bacteriology: CMIA, ViteK, BacT Alert 3D system.	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Clinical Biochemistry			
<b>Course Code</b>	BMLT4003			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To develop the knowledge about liver function test
2. To gain the knowledge of renal function test and urolithiasis.
3. To gain the knowledge of gastric function and cardiac function.
4. To know clinical diagnosis of Diabetes Mellitus
5. To gain the knowledge of quality control in biochemistry laboratory

### Course Outcomes

On completion of course student will be able to,

<b>CO1</b>	Perform liver function test by semi auto analyzer and interpret the test results.
<b>CO2</b>	Perform and assess renal functioning and describe urolithiasis.
<b>CO3</b>	Perform and understand gastric function and cardiac function.
<b>CO4</b>	Diagnose and describe Diabetes Mellitus and explain metabolic defects
<b>CO5</b>	Perform and explain quality control in biochemistry laboratory and automation used
<b>CO6</b>	Discuss the Laboratory diagnostic approaches in metabolic disorders

### Text Book (s)

- 1 Raju Bindu, Review of Medical Biochemistry.
- 2 Geeta Damodaran K, Practical Biochemistry.
- 3 Manipal manual of Biochemistry by S.Nayak

### Reference Book (s)

- 1 DS Sheriff, Textbook of Medical Biochemistry.
- 2 U. Satyanarayana: Textbook of Medical Biochemistry.

<b>Unit-1 Liver function tests hours</b>	<b>9</b>
Liver function tests: Liver functions, Assessments - Based on its metabolic functions, Measurement of serum enzyme levels, Bile Pigment metabolism, jaundice, its types, & their biochemical findings.	
<b>Unit-2 Urolithiasis &amp; Renal Function Tests hours</b>	<b>8</b>
RFT- Clearance tests, Concentration tests, dilution tests.  Renal calculi- Introduction, Etiology, Pathophysiology, Factors influencing, Types, Risk Factors, Control.	
<b>Unit-3 Gastric Function tests and Cardiac Profile hours</b>	<b>9</b>
Gastric Function tests: Composition of Gastric Juice, free acidity & total Acidity, Gastric stimulants, Tubeless gastric analysis Cardiac Profile- Hypertension, MI, pattern of Cardiac Enzymes in Heart diseases	
<b>Unit-4 Diabetes Mellitus. hours</b>	<b>8</b>
Diabetes Mellitus: Introduction, symptoms, types, Clinical Manifestations, Diabetic ketoacidosis, Control of Hyperglycemia. Lipoproteinemia, Atherosclerosis & control of Hypercholesterolemia.  Alkaptonuria, Albinism, Maple syrup urine disease.	
<b>Unit-5 Quality control &amp; Automation hours</b>	<b>6</b>
Quality control & Automation in clinical biochemistry laboratory	
<b>Unit-6 Laboratory diagnostic approaches in metabolic disorders hours-8</b>	
Laboratory diagnostic approaches in metabolic disorders, Diagnostic Advancement in Evaluating Inborn Errors of Metabolism	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100





<b>Name of The Course</b>	Laboratory Quality Management-II			
<b>Course Code</b>	BMLT4004			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	2	0	0	2

### Course Objectives:

1. To develop the knowledge about basic concept of laboratory quality management
2. To gain the knowledge of Inspect sources of variation in laboratory results and method of detection of errors
3. To gain the knowledge of the external quality control

### Course Outcomes

On completion of course student will be able to;

<b>CO1</b>	Apply knowledge on External and Internal audit laboratory quality management process
<b>CO2</b>	Build in depth knowledge of how Internal quality control is maintained within the laboratory
<b>CO3</b>	Inspect sources of variation in laboratory results ,method of detection of errors and corrective and preventive actions.
<b>CO4</b>	Build in depth knowledge of how external quality control is maintained and process of EQAP
<b>CO5</b>	Illustrate the organization requirements for a quality management system

### Text Book (s)

- 1 ICMR(2008) guidelines for good clinical laboratory practices.
- 2 Hospital waste Management : Chapter 13 ,PARK'S Textbook of Preventive and Social Medicine,18th Edition
- 3 Manipal Manual of Biochemistry by Shivanand nayak by Jaypee publications

### Reference Book (s)

- 1 NIH :DIADS guidelines for Good Clinical Laboratory Practice Standards,2011

2 WHO : Good Clinical Laboratory Practice (GCLP),2009

<b>Unit-1 Assessment—audits</b>	<b>6 hours</b>
External audit-Internal audit- Internal audit programme- Actions as result of audit	
<b>Unit-2 Internal quality control</b>	<b>6 hours</b>
Internal quality control -basic steps-Laboratory Testing Process- Pre analytical-Analytical-Post Analytical	
<b>Unit-3 Laboratory errors</b>	<b>6 hours</b>
Sources of variation in laboratory results -Methods of detection of errors - Types of error - Corrective measures to minimize the errors- CAPA - corrective action & preventive action	
<b>Unit-4 External Quality control</b>	<b>6 hours</b>
External quality control-Proficiency testing programme -Participation in E.Q.A.P.	
<b>Unit-5 Quality management system</b>	<b>6 hours</b>
Organizational requirements for a quality management system	

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Infection Control & Prevention-II			
<b>Course Code</b>	BMLT4005			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	2	0	0	2

### Course Objectives:

1. To develop the knowledge about prevention and control of infectious and Communicable diseases in health-care workers
2. To gain the knowledge of Multi-Drug Resistant Organism (MDRO'S) in infection prevention
3. To gain the knowledge of infection prevention as applied to nursing homes and long term care facilities

### Course Outcomes

On completion of course student will be able to,

<b>CO1</b>	Acquire knowledge in Construction, renovation, repair and demolition in health care facilities
<b>CO2</b>	Practice prevention and control of infectious and Communicable diseases in health-care workers
<b>CO3</b>	Illustrate the characteristics, clinical syndromes, prevention of problems, transmission ,infection preventive measures of Multi-Drug Resistant Organism (MDRO'S) in infection prevention
<b>CO4</b>	Illustrate the Multi-Drug Resistant Organism (MDRO'S) in infection prevention
<b>CO5</b>	Explain infection prevention as applied to nursing homes and long term care facilities

### Text Book (s)

- 1 ICMR(2008) guidelines for good clinical laboratory practices.
- 2 Hospital waste Management : Chapter 13 ,PARK'S Textbook of Preventive and Social Medicine,18th Edition

### Reference Book (s)

- 1 NIH :DIADS guidelines for Good Clinical Laboratory Practice Standards,2011
- 2 WHO : Good Clinical Laboratory Practice (GCLP),2009

<b>Unit-1 Professional Responsibility for Infection Prevention</b>	<b>6 hours</b>
Construction, renovation, repair and demolition in health care facilities	
<b>Unit-2 Prevention and control of infectious and Communicable diseases in health-care workers</b>	<b>6 hours</b>
Overview of occupational health strategies for infection prevention- Prevention and control of blood borne pathogen transmission - Evaluation of HCWs infected with HIV, HBV, or other blood borne pathogens	
<b>Unit-3 Current topics in infection prevention-I</b>	<b>6 hours</b>
Multi-Drug Resistant Organism (MDRO'S) to include: -Methicillin Resistant Staphylococcus Aureus (MRSA), - Vancomycin Resistant Enterococci (VRE), -Clostridium Difficile (C.DIFF), -Multi-Drug Resistant Tuberculosis (MDRTB) -Extended Spectrum Beta-Lactamase (ESBL),	
<b>Unit-4 Current topics in infection prevention-II</b>	<b>6 hours</b>
Multi-Drug Resistant Organism (MDRO'S) to include: -Carbapenem-resistant Enterobacteriaceae (CRE) -Severe Acute Respiratory Syndrome (SARS) -Creutzfeld Jacob Disease -Ebola Virus Disease (EVD) and Zika virus	
<b>Unit-5 Infection prevention as applied to nursing homes and long term care facilities</b>	<b>6 hours</b>
Infection prevention as applied to nursing homes and long term care facilities	

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Haematology & Haematological diseases Lab			
<b>Course Code</b>	BMLT4051			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge to identify anaemia's.
2. To gain the knowledge of perform various blood cells counting.
3. To gain the knowledge of diagnose different types of inflammatory and clotting disorders.

### Course Outcomes

On completion of course student will be able to,

<b>CO1</b>	Perform and analyse hemogram by collecting blood sample , do blood cell counts and correlate the test
<b>CO2</b>	After the completion of course, students able to perform various blood cells counting.
<b>CO3</b>	After the completion of course, students able to perform and analyse different hematological blood test to daignose different types of inflammatory and clotting disorders.

### Text Book (s)

- 1 Text book of Medical Laboratory Technology by Paraful B. Godkar
- 2 Practical Haematology by JB Dacie
- 3 Medical laboratory Technology by KL Mukherjee Volume-I

### Reference Book (s)

- 1 Clinical Diagnosis & Management by Laboratory methods (20th edition) by John Bernard Henry
- 2 Atlas of haematology (5th edition) by G.A. McDonald

3 De Gruchy's clinical haematology in medical practice

<b>List of Experiments</b>	
1	Good laboratory practices in hematology laboratory
2	Handling and usage of Microscope
3	Preparation of different types of anticoagulants used in hematology
4	Demonstration of Collection of blood
5	Preparation of Blood smears
6	Demonstration of DLC
7	Demonstration of TRBC
8	Demonstration of TWBC
9	Demonstration of Platelet count
10	Demonstration of ESR
11	Demonstration of PCV
12	Demonstration of BT & CT
13	Calculation of Blood Cell Indices
14	Examination of Blood Smear for Abnormal Cells
15	Demonstration of Reticulocyte count

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Immunology & Bacterial serology Lab			
<b>Course Code</b>	BMLT4052			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge about performing serological tests
2. To gain the knowledge of detect Ag or Ab by immune fluorescence /immune diffusion techniques.
3. To gain the knowledge of ELISA, SDS-PAGE techniques and its applications

### Course Outcomes

On completion of course student will be able to,

<b>CO1</b>	Perform/ Demonstrate various serological tests in identification of different diseases
<b>CO2</b>	Demonstrate/detect Ag or Ab by immune fluorescence /immune diffusion techniques and ELISA, SDS-PAGE techniques.

### Text Book (s)

1. Text book of Microbiology by Ananthanarayan
2. Text book of Microbiology: CP. Baveja
3. Text book of immunology by: SK: Gupta

### Reference Book (s)

1. Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
2. Medical Microbiology by Paniker & Satish Gupte
3. Medical laboratory Technology Vol. I ,II, III by Mukherjee
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough



<b>List of Experiments</b>	
1	Collection of blood sample by vein puncture, separation and preservation of serum
2	WIDAL Test
3	VDRL (including Antigen Preparation
4	ASO (Anti streptolysin 'O')
5	C-Reactive Protein (Latex agglutination)
6	Rheumatoid factor (RF) Latex agglutination
7	Demonstration of antigen / antibody, determination by Immuno fluorescence (IF), Immuno diffusion, precipitation in Agarose gel (Ouchterlony)
8	Demonstration of ELISA
9	Demonstration of SDS – PAGE
10	Preparation of Vaccination schedule

#### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Clinical Biochemistry Lab			
<b>Course Code</b>	BMLT4053			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge about perform liver and kidney function test
2. To gain the knowledge of heart function test.
3. To gain the knowledge of biochemistry auto analyzers.

### Course Outcomes

On completion of course student will be able to,

<b>1</b>	Perform and analyze blood sample for assessing the function of liver, kidney and heart and correlate with clinical conditions in clinical biochemistry laboratory.
<b>2</b>	Perform and analyze blood sample for assessing the function of heart and correlate with clinical conditions in clinical biochemistry laboratory.
<b>3</b>	Students will be able to demonstrate about gastric sample collection and working of biochemistry autoanalyzers.

### Text Book (s)

1. Raju Bindu, Review of Medical Biochemistry
2. Geetha Damodaran K, Practical Biochemistry

### Reference Book (s)

1. DS Sheriff, Textbook of Medical Biochemistry
2. U. Satyanarayana, Textbook of Medical Biochemistry

<b>List of Experiments</b>	
1	Serum Bilirubin total estimation
2	Serum amylase estimation
3	Serum GOT (AST) estimation
4	Serum GPT (ALT) estimation
5	Alkaline phosphatase estimation
6	Acid phosphatase estimation
7	Determination of OGTT
8	Serum Total Proteins estimation
9	Serum Creatinine estimation
10	Blood Urea Estimation
11	Serum Cholesterol estimation
12	Demonstration of Collection of Gastric Juice
13	Demonstration of working of Random Access Analyzer( RAA)

#### **Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Virology & Mycology			
<b>Course Code</b>	BMLT5001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

**Course Objectives:**

- 1 To develop the knowledge on basic diagnosis of fungal infections
- 2 To gain the knowledge on diseases caused by fungi
- 3 To develop the basic knowledge on DNA and RNA viruses
- 4 To know clinical importance and laboratory diagnosis of viruses

**Course Outcomes:**

On completion of course student will be able to,

CO1	Related basic diagnostic tests to identify the fungus
CO2	outline diseases caused by fungus
CO3	Develop knowledge regarding the Structure & classification of viruses
CO4	Classify various types of RNA viruses
CO5	Classify various types of DNA viruses
CO6	Discuss the Importance of Advanced gene sequencing techniques

**Text Book (s)**

1. Arora, Medical Lab Technology
2. Mycology And Microbiology: A Textbook For Ug And Pg Courses C.Manoharachary
3. Text book of Medical mycology by Jagadish Chander, 4<sup>th</sup> Edition
4. Text Book of Virology by Vinod singh

**Reference Book (s)**

1. Practical Medical Microbiology by Mackie & Mac. Cartney Volume 1 and 2
2. Text book of Microbiology by C P Baveja

<b>Unit-1 Mycology</b>	<b>8 hours</b>
Introduction to medical mycology, basic concepts about superficial and deep mycoses taxonomy, classification & general characteristics of Various medically important fungi.	
<b>Unit-2 Fungal infection</b>	<b>8 hours</b>
Names of fungi & diseases caused by them; superficial mycoses, candida, dermatophytes, opportunistic fungi, subcutaneous mycoses	
<b>Unit-3 Virology</b>	<b>7 hours</b>
Introduction, classification of virus, collection, Transport, & Storage of sample for Viral diagnosis. Staining Techniques used in virology, Processing of sample for viral diagnosis (Egg Inoculation & Tissue culture)	
<b>Unit-4 RNA Viruses</b>	<b>9 hours</b>
RNA Viruses: Polio myelitis, Rhino virus, Influenza, Rabies, Arbo viruses, Measles Mumps, Rubella, HIV	
<b>Unit-5 DNA Viruses</b>	<b>8 hours</b>
DNA viruses: Small Pox, HSV, CMV, EBV, Varicella Zoster, Hepatitis, Adeno virus	
<b>Unit – 6 PCR and Next generation DNA Sequencing techniques to identify viral genome:</b>	<b>8 hours</b>
History of PCR, Principle of PCR, Stages of PCR, procedure of PCR, Concept of optimization of PCR, Applications of PCR, Advancements in PCR technology, DNA sequencing techniques, Methods of DNA Sequencing, Next generation DNA sequencing techniques	

#### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Transfusion Medicine			
<b>Course Code</b>	BMLT5002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1 To develop the basic knowledge in Transfusion medicine (or transfusiology) – the branch of medicine that deals with the transfusion of blood.
- 2 To learn the principles and best practices involved in blood collection
- 3 To learn blood components separation and storage.
- 4 To know safe blood transfusion and adverse reactions.

### Course Outcomes:

On completion of course student will be able to,

CO1	Define mechanism of hemostats ,coagulation pathways and physiology of blood cells.
CO2	Demonstrate human blood group systems and practice blood grouping and other tests.
CO3	Organize patient donor selection or rejection and perform ,screening tests and compatibility testing.
CO4	Inspect adverse donor reactions and explain complications of mismatched transfusion.
CO5	Examine various fractions of blood.
CO6	Build skills in handling advanced techniques in blood banking

### Text Book (s)

1. Practical haematology by JB Dacie
2. Transfusion Science by Overfield, Hamer
3. Medical laboratory Technology by KL Mukherjee Volume-I

### Reference Book (s)

1. Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein
2. Medical Laboratory Technology by Mukherjee

<b>Unit-1 Introduction of transfusion medicine</b>	<b>8 hours</b>
History of transfusion medicine, RBC, WBC, Platelets-production, structure, functions & Life span. Hemoglobin structure function & degradation. Hemostasis, role of platelets, coagulation pathways, Fibrinolysis	
<b>Unit-2 Concept of Stoichiometry</b>	<b>8 hours</b>
Introduction to Human Blood Group systems, ABO systems, Rh System, Hemolytic Disease of New-born & Prevention. Blood grouping techniques, Cell grouping, Serum grouping, (Slide & Tube Method) Rh grouping by slide & tube method, Difficulties in ABO grouping & its importance.	
<b>Unit-3 Blood bank</b>	<b>10 hours</b>
Donor selection & rejection criteria, Health checks before donating, Types of anticoagulants, types of blood bags, component separation, Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing cross matching (Major & Minor). Coombs test Direct & Indirect	
<b>Unit-4</b>	<b>7 hours</b>
Instructions given to the donor after blood donation, Adverse donor reaction. Complication & hazards of blood transfusion reactions & mismatched blood transfusion. Artificial blood	
<b>Unit-5</b>	<b>7 hours</b>
Preparation of various fractions of blood, packed red cells, washed red cells, & frozen red cells, platelet rich plasma, platelet concentrate, frozen platelets, fresh plasma, fresh frozen plasma, cryoprecipitate.	
<b>Unit – 6 Recent techniques used in blood bank</b>	<b>7 hours</b>
"Recent techniques used in blood bank/ Quality control Automation-solid phase technology, Gel Technology, Affinity Column Technology. Haemopheresis: pertaining to Leucocytes, platelets and plasma. Quality control in blood bank. "	

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Universal human values and ethics			
<b>Course Code</b>	LLL101			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

### Course Outcomes:

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

CO1	The students shall be able to understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	The students shall be able to identify values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual
CO3	The students shall be able to analyze the value of harmonious relationship based on trust and respect in their life and profession
CO4	The students shall be able to analyze the role of a human being in ensuring harmony in society and nature.
CO5	The students shall be able to evaluate ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work
CO6	The students shall be able to evaluate soft skill development in education and attainment of happiness.

### Text Book (s)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

### Reference Book (s)



1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.  
B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

<b>Unit-1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</b> <b>8 hours</b>
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|---|
| <ol style="list-style-type: none"> <li>1. Understanding the need, basic guidelines, content and process for Value Education</li> <li>2. Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration</li> <li>3. Continuous Happiness and Prosperity- A look at basic Human Aspirations</li> <li>4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority</li> <li>5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario</li> <li>6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels</li> </ol> |
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<b>Unit-2 Understanding Harmony in the Human Being - Harmony in Myself</b> <b>8 hours</b>
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| <ol style="list-style-type: none"> <li>1. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’</li> <li>2. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha</li> <li>3. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)</li> <li>4. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’</li> <li>5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of physical needs, meaning of Prosperity in detail</li> <li>6. Programs to ensure Sanyam and Swasthya</li> </ol> |
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<b>Unit-3 Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</b> <b>10 hours</b>
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| <ol style="list-style-type: none"> <li>1. Understanding harmony in the Family- the basic unit of human interaction</li> <li>2. Understanding values in human-human relationship; meaning of <i>Nyaya</i> and program for its fulfilment to ensure <i>Ubhay-tripti</i>;<br/><br/>Trust (<i>Vishwas</i>) and Respect (<i>Samman</i>) as the foundational values of relationship</li> </ol> |
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3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha* )- from family to world family!

**Unit-4 Understanding Harmony in the Nature and Existence - Whole existence as Co-existence  
7 hours**

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

**Unit-5 Implications of the above Holistic Understanding of Harmony on Professional Ethics**

**7 hours**

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in Professional Ethics:
  - a) Ability to utilize the professional competence for augmenting universal human order,
  - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models
5. Case studies of typical holistic technologies, management models and production system
6. Strategy for transition from the present state to Universal Human Order:
  - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  - b) At the level of society: as mutually enriching institutions and organizations

**Continuous Assessment Pattern**

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Medical Laboratory Technician-I			
<b>Course Code</b>	BMLT5003			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	6	0	0	6

### Course Objectives:

- 1 To develop the knowledge on training candidates for the job of a “Medical Laboratory Technician”, in the “Healthcare” Sector/Industry.
- 2 To gain the knowledge on basic clinical laboratory practice
- 3 To learn how to setup your own lab.
- 4 To know the maintain record and reporting format

### Course Outcomes:

On completion of course student will be able to,

CO1	Recall Hospital/Diagnostic center organization,setup,facilities provided at health care systems in National/State/District level and to develop role and responsibilities of Medical laboratory technician.
CO2	Demonstrate safe disposal methods of biomedical waste ,how to maintain personnel hygiene and apply knowledge in basic testing of Biochemistry,hematology,clinical pathology laboratory.
CO3	Apply Basic knowledge in clinical biochemistry, bacteriology, serology laboratory and practice post analytical laboratory testing process
CO4	Determine Analytical laboratory testing process and apply knowledge in maintaining restful environment in health care setting.
CO5	Explain documentation types,uses,importance of records,guidelines to be followed and apply knowledge in Observing and reporting while dealing with patients.
CO6	Discuss Point of care testing(POCT ) and It’s applications

### Text Book (s)

1. Text book of Biochemistry by U. Satyanarayana

2. Text book of Medical Laboratory Technology by Godkar
3. Textbook of Parasitology by CP. Baveja
4. Essentials of Physiology by Sembulingam
5. Textbook of Pathology by Harshamohan
6. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone

#### Reference Book (s)

1. Textbook of Microbiology By Presscott
2. Textbook of Immunology by S.K gupta
3. Textbook of Hematology & Clinical pathology by Ram das naik
4. WHO : Good Clinical Laboratory Practice (GCLP),2009
5. Hand book of Health care quality & patient safety

<b>Unit-1</b>	<b>Healthcare Systems, Role of the Medical Laboratory Technician &amp; lab terminology</b>	<b>26 hours</b>
<ul style="list-style-type: none"> <li>• Healthcare Systems, Laboratory and Delivery: Basic Understanding of Healthcare Service Providers (primary, secondary &amp; tertiary), Basic Understanding of Hospital Functions, Basic Understanding of Diagnostic Centres and medical laboratory facilities, Understanding of Laboratory at different level (National / State / District)</li> <li>• Role of the Medical Laboratory Technician: To develop broad understanding of the Role of MLT, To identify Laboratory maintenance needs to be taken care by MLT, To develop Understanding of Patient Comforts and Safety, To develop understanding of Laboratory Test Results, To exhibit Ethical Behaviour.</li> <li>• Introduction to Laboratory related Medical Terminology: Understand appropriate use of laboratory related medical terminology in daily activities with colleagues, patients and family.</li> </ul>		
<b>Unit-2</b>	<b>Body fluids, Personal hygiene &amp; Bio medical waste management</b>	<b>21 hours</b>
<ul style="list-style-type: none"> <li>• Introduction to Biochemistry, Haematology and Clinical Pathology &amp; Examination of Semen, CSF and Knowledge about Other Body Fluids Like Pleural Fluid, Pericardial Fluid, Peritoneal Fluid, Synovial Fluid, Ascitic Fluid.</li> <li>• Personnel Hygiene: To develop understanding of the concept of Healthy Living, procedures of Hand Hygiene, to develop techniques of Grooming, To be equipped with Techniques of Use of PPE, To be vaccinated against common infectious diseases</li> <li>• Bio Medical Waste Management: To learn &amp; gain understanding of importance of proper and safe disposal of bio-medical waste &amp; treatment, categories of biomedical waste, colour coding, types of containers, transportation of waste, etc</li> </ul>		
<b>Unit-3</b>	<b>Pre-analytical Laboratory Testing Process</b>	<b>26 hours</b>
<p>To gain broad understanding of different types of samples to be taken in medical laboratory, sample Handling, different equipment useful for blood sample collection, correct method of blood sample collection, collection method of samples other than blood samples, correct procedure of sample transportation.</p> <ul style="list-style-type: none"> <li>• Introduction to Clinical Biochemistry: Electrolytes, Therapeutic Drug Monitoring, Acid Base Balance.</li> <li>• Introduction to Bacteriology, Immunology and Serology</li> <li>• Sensitization to Blood Banking Understand Immuno- hematology</li> </ul>		

<b>Unit-4 Professional Behaviour, Laboratory planning, &amp; sample processing</b>	<b>23 hours</b>
<ul style="list-style-type: none"> <li>• Professional Behaviour in Healthcare Setting How to maintain restful environment, General and Specific etiquettes to be observed on duty, Understand need for compliance of organizational hierarchy and reporting, Understand the legal and ethical issues &amp; importance of conservation of resources in laboratories</li> <li>• Analytical Laboratory Testing Process-I: To gain broad understanding about Laboratory planning, laboratory operations, care of laboratory glassware, equipment and instruments, Specimen Handling, understanding of setting up, calibrating, operating, cleaning, maintaining, troubleshooting and validation of laboratory equipment used in quantitative or qualitative analysis.</li> </ul>	
<b>Unit-5 Observing &amp; Reporting</b>	<b>24 hours</b>
<ul style="list-style-type: none"> <li>• Observing &amp; Reporting: Understand the importance and method of Observing and reporting while dealing with patients during sample and report collection, method of Observing and reporting while assisting the pathologists and other members of the team, importance of verbally informing the person in authority</li> <li>• Documentation: Understand guidelines for documentation, Collecting documentation, Types of records in laboratory set up, uses and importance of records, Essential requirement of records, abbreviations and symbols, Enter, transcribe, record, store, or maintain information in written or electronic/magnetic form</li> </ul>	
<b>Unit – 6 Recent advancements in Point of test care Technology</b>	<b>8 hours</b>
Introduction to Point-of-care testing (POCT or bedside testing), Applications of POCTs, Benefits of point of care tests.	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Phlebotomy-I			
<b>Course Code</b>	BMLT5004			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	6	0	0	6

### Course Objectives:

- 1 To develop the knowledge on human anatomy and physiology .
- 2 To gain knowledge on the health care system.
- 3 To learn types of laboratory and its services
- 4 To know the personal safety during the work in the lab

### Course Outcomes:

On completion of course student will be able to,

CO1	Teach human circulatory system and digestive system
CO2	Teach the human respiratory and nervous system.
CO3	Understanding the health care system and laboratory service.
CO4	Demonstrate the personal safety and first aid
CO5	Perform personal hygiene
CO6	Can able to formulate test environment by using automation

### Text Book (s)

1. Ross and wilson, Anatomy and physiology in health and illness, 12th Edition, Elsevier publication
2. Prabhjot kaur, Textbook of Antomy and Physiology, 2nd Edition, lotus publication.

### Reference Book (s)

1. PR. Ashalatha, G Deepa, Textbook of Antomy and Physiology for Nurses,4th edition, Jaypee brothers medical publications.
2. Medical Laboratory Technology by Mukherjee

<b>Unit-1</b>	<b>Structure and Function of Human Body:-1.</b>	<b>15 hours</b>
Anatomical terminology of human body. Endocrine system secretions and excretions different parts of body. Cardiovascular system and blood vessels. Digestive System in human body.		
<b>Unit-2</b>	<b>Structure and Function of Human Body:-2</b>	<b>15 hours</b>
Respiratory system, Urinary System, Nervous System, Integumentary system and Lymphatic system and body fluids		
<b>Unit-3</b>	<b>Introduction to Healthcare Systems &amp; Laboratory Service</b>	<b>15 hours</b>
Basic Understanding of Healthcare Service. Providers (primary, secondary & tertiary). Basic Understanding of Hospital Functions. Basic Understanding of Diagnostic Centers and Medical Laboratory Facilities. Understanding of Laboratory facilities at different level (National / State / District)		
<b>Unit-4</b>	<b>Safety &amp; First Aid:</b>	<b>15 hours</b>
To develop understanding and precautions to ensure Patient's Safety. To develop basic understanding and precautions to ensure sample preservation while transporting. Describe common emergency conditions and what to do in medical emergencies. Describe basics of first aid. To develop understanding and precautions to ensure self-safety.		
<b>Unit-5</b>	<b>Personnel Hygiene</b>	<b>15 hours</b>
To develop understanding of the concept of Healthy Living. To develop understanding & procedures of Hand Hygiene. To develop techniques of Grooming. To be equipped with Techniques of Use of PPE. To be vaccinated against common infectious Disease		
<b>Unit – 6</b>	<b>Recent advancements in laboratory automation</b>	<b>8 hours</b>
Advancements in blood collection and devices used and Robotic System for Blood Sampling- sampling robot for automated blood drawing and testing, future of blood testing robotic		

#### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
10	20	70	100

<b>Name of The Course</b>	Virology & Mycology Lab			
<b>Course Code</b>	BMLT5051			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

1. To develop the knowledge on diagnosis of fungal infections and specimen collection.
2. To gain the knowledge on laboratory diagnosis of fungi
3. To learn the rapid diagnosis of virus and embryonated egg culture techniques

### Course Outcomes:

On completion of course student will be able to,

CO1	Diagnose fungal infection by performing fungal tests and to demonstrate virus culture by embryonated egg technique.
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### Text Book (s)

1. Practical Medical Microbiology by Mackie & Mac. Cartney Volume 1 and 2

### Reference Book (s)

1. Medical laboratory Technology Vol. I, II, III by Mukherjee

### List of Experiments

1. Good laboratory practices in mycology laboratory
2. Prepare routine culture used in mycology laboratory
3. Perform Alcian blue stain
4. Perform collection of samples from Hair, Nail, & Skin
5. Perform collection samples from body fluids and Secretions
6. Good laboratory practices in virology laboratory
7. Demonstration of virus culture by embryonated egg techniques

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
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30		70	100
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<b>Name of The Course</b>	Transfusion Medicine Lab			
<b>Course Code</b>	BMLT5052			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	2	1

### Course Objectives:

- 1 To develop the basic knowledge in Transfusion medicine (or transfusiology) - the branch of medicine that deals with the transfusion of blood.
- 2.To practice the principles and best practices involved in blood collection
- 3.To practice blood components separation and storage.
- 4.To know safe blood transfusion and adverse reactions

### Course Outcomes:

On completion of course student will be able to,

CO1	Explain donor selection and investigations done on donor blood screening & cross matching.
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### Text Book (s)

1. Practical haematology by JB Dacie
2. Transfusion Science by Overfield, Hamer
3. Medical laboratory Technology by KL Mukherjee Volume-I

### Reference Book (s)

1. Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein
2. Medical Laboratory Technology by Mukherjee

### List of Experiments

1. 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, Microfilaria, HBsAg, syphilis and HIV
5. Determine the ABO & Rh grouping
6. Perform Direct and Indirect Coomb's test
7. Perform cross matching (Major & Minor)
8. Demonstration of components separation

**Continuous Assessment Pattern**

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Medical Laboratory Technician Lab-I			
<b>Course Code</b>	BMLT5053			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	6	3

### Course Objectives:

- 1 To develop the knowledge on performing clinical skills essential in providing basic diagnostic services such .
- 2 To gain knowledge on samples Correctly collect, transport, receive, accept or reject and store blood /urine/stool and tissue samples, etc.
- 3 To learn Conduct analysis of body fluids/ samples; Maintain, operate and clean laboratory equipment.
- 4 To know the maintain record and reporting format

### Course Outcomes:

On completion of course student will be able to,

CO1	Explain blood sample for different parameter in hematology,clinical biochemistry& Microbiology laboratory in assessing and reporting it.
CO2	Demonstrate and practice laboratory set up, ethics and basic collection of sample.
CO3	Demonstrate working of various instruments used and laboratory process and to practice policies and procedures in Biomedical waste disposal in hospitals

### Text Book (s)

1. Raju Bindu, Review of Medical Biochemistry
2. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone
3. Anatomy for Nurses By Asha Latha
4. Hand book of Health care quality & patient safety
5. Text book of Medical Laboratory Technology by Godkar
6. Damodaran K, Practical Biochemistry
7. Textbook of Parasitology by CP. Baveja

### Reference Book (s)

1. Textbook of Microbiology By Prescott
2. Textbook of Pathology by Harshamohan
3. Textbook of Immunology by S.K Gupta

4. Textbook of Hematology & Clinical pathology by Ram das naik
5. U.Satyanarayana, Textbook of Medical Biochemistry

### List of Experiments

1. Ethics of Laboratory
2. Laboratory safety and First aid
3. Demonstration of different systems of whole body (Models/Charts)
4. Demonstration of Blood collection
5. Separation of Serum/Plasma
6. Collection and preservation of Urine
7. Estimation of Hemoglobin by various methods
8. Demonstration of Reticulocyte count
9. Demonstration of Total Red blood cell count
10. Demonstration of Total White blood cell count
11. Demonstration of Bleeding Time
12. Demonstration of Clotting Time
13. Determination of ESR
14. Examination of Urine (Physical/Chemical/Microscopic)
15. Microscopic examination of stool
16. Collection and examination of sputum
17. Examination of Semen
18. Sample formats for test requisition
19. Demonstration of procedure for hand hygiene
20. Demonstration of handling and disposal of Biomedical waste
21. Demonstration of biohazard bags for waste disposal
22. Demonstration of Grams staining
23. Demonstration of cultivation of bacteria
24. Demonstration of different sterilization methods
25. Demonstration of ABO Grouping
26. Demonstration of Rh typing
27. Demonstration of Cross matching of blood
28. Demonstration of investigating transfusion reactions
29. Demonstration of working of Semiautoanalyzer
30. Sample formats for equipment maintenance

### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

<b>Name of The Course</b>	Phlebotomy Lab-I			
<b>Course Code</b>	BMLT5054			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	6	3

### Course Objectives:

- 1 To develop the knowledge on human anatomy and physiology .
- 2 To gain knowledge on patient safety and hospital function
- 3 To learn and performed first aid and personal hygiene
- 4 To know the personal safety during the work in the lab

### Course Outcomes:

On completion of course student will be able to,

CO1	Teach anatomy and physiology of human body
CO2	Understand personnel hygiene
CO3	Understand first aid.

### Text Book (s)

1. P.R Ashalatha Text book of anatomy and physiology for nurses, Jaypee brothers medical publication.
2. Text book of Medical Laboratory Technology by P. B. Godker

### Reference Book (s)

1. Good laboratory practices
2. Demonstration of anatomical positions of human body.
3. Demonstration of Anatomy of heart
4. Demonstration of Kidney
5. Demonstration of digestive system.
6. Demonstration of Lungs
7. Demonstration of Laboratory setup.
8. Demonstration of first aid (CPR)
9. Demonstration of hand washing technique.
10. Demonstration of medical lab technician vaccination procedure.

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>Name of The Course</b>	Parasitology			
<b>Course Code</b>	BMLT6001			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1.To study and gain the knowledge of life cycle, clinical symptoms in each type of parasitic infection.
2. To study and gain the knowledge diagnosis treatment, control & prevention of various Medically important parasites

### Course Outcomes

On completion of course student will be able to,

<b>CO1</b>	Teach & Discuss the mechanism of disease production by parasites
<b>CO2</b>	Diagnose the parasitic infections caused by Rhizopoda & Mastigophora
<b>CO3</b>	Diagnose the parasitic infections caused by Sporozoa & Ciliata
<b>CO4</b>	Diagnose the parasitic infections caused by Nematodes
<b>CO5</b>	Diagnose the parasitic infections caused by Cestodes
<b>CO6</b>	Discuss on diagnosis of parasite by Electrophoretic Techniques

### Text Book (s)

- 1.Text book of Parasitology by C P. Baveja
- 2.Medical microbiology by Satish Gupta
3. Parasitology in relation to the clinical medicine by K D Chatterjee
4. Ananthanarayana and Panikar, Text book of Microbiology

### Reference Book (s)

1. Parasitology in relation to the clinical medicine by K D Chatterjee
2. Anantha Narayan and Panikar, Textbook of Microbiology.

<b>Unit-1 Introduction of Parasitology</b>	<b>5 hours</b>
Introduction about Parasitology, taxonomy and classification, parasite, host, mechanism of disease production by parasites, Reaction of host to parasite.	
<b>Unit-2 Classification of Protozoa</b>	<b>10 hours</b>
Classification of Protozoa a) Rhizopoda (E. Hsitolytica) b) Mastigophora( Giardia Lamblia, Leishmania Donovanii, Trichomonas Homnis)	
<b>Unit-3 Classification of Protozoa</b>	<b>9 hours</b>
a) Sporozoa (Malarial Parasites, Toxoplasma Gondii) b) Ciliata (Balantidium Coli)	
<b>Unit-4 Classification of Helimints</b>	<b>12 hours</b>
Nematodes (Trichinella Spiralis, Trichuris trichura, Ascaris Lumbricoids, Ancylostoma duodenale, Strongyloides stercoralis, Enterobuds Vermicularis, Dracanculus Medinensis, Wuchereria Bancrofti)	

<b>Unit-5 Classification of Helimints</b>	<b>9 hours</b>
Cestodes (Diphyllobothrium Latum, Taenia saginata, Taenia solium, Cystercus cellulosae, Echinococcus granulosus, Trematodes ( Schistosoma hematobium)	
<b>Unit-6: Advanced techniques for diagnosis of parasite infections</b>	<b>8 Hours</b>
Advanced techniques for diagnosis of parasite infections, Electrophoretic Techniques	

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100



<b>Name of The Course</b>	Clinical Laboratory Practice			
<b>Course Code</b>	BMLT6002			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1.To practice of good clinical laboratory practices followed in laboratory
2. To gain the knowledge of organization and infrastructure of clinical laboratory
- 3.To gain the knowledge of Ethical considerations to be followed, maintaining quality & safety in Laboratory
- 4.To practice Bio medical Waste Management rules, process of collection and disposal.

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Explain the different levels of laboratory services provided and to apply knowledge to follow safe practices and procedures in case of accidents and emergencies occur in the laboratory.
<b>CO2</b>	Practice how to setup the infrastructure of laboratory and SOP needed in maintaining laboratory personnel and equipment's.
<b>CO3</b>	Differentiate the appropriate method of biomedical waste management and apply knowledge in collection, transportation, redistribution and disposal and methods of disinfection.
<b>CO4</b>	Practice the four Biosafety Laboratory Levels, emergency response procedure and explain what types of risks are involved when working in a lab.
<b>CO5</b>	Practice laboratory ethics and how to maintain continuous quality improvement in the laboratory.
<b>CO6</b>	Solve the problems encountered during emergency care

### Text Book (s)

1. ICMR(2008) guidelines for good clinical laboratory practices.
2. Hospital waste Management : Chapter 13 ,PARK'S Textbook of Preventive and Social Medicine,18th Edition

### Reference Book (s)

1. NIH :DIADS guidelines for Good Clinical Laboratory Practice Standards,2011
2. WHO : Good Clinical Laboratory Practice (GCLP),2009

<b>Unit-1 Laboratory services</b>	<b>6 hours</b>
Levels of laboratories-Primary level, Secondary level and Tertiary level, Reference laboratories, Research laboratories and Specific disease reference laboratories. Accidents and emergencies, First aid in the laboratory	
<b>Unit-2 Infrastructure in the laboratories</b>	<b>8 hours</b>
Laboratory space :Reception, specimen collection, quality water supply, work area, specimen/sample/slide storage, cold storage, record room, wash room, biomedical waste room, fire	

safety, etc. Personal in the laboratory –Qualifications as per NABL document Equipment Listing, cleaning, maintenance, SOP, verification of performance, Internal quality control
<b>Unit-3 Bio medical waste management</b> <span style="float: right;"><b>9 hours</b></span>
Bio medical waste management and environment safety- Definition of Biomedical Waste - Waste minimization ;BMW – Segregation, collection, transportation, treatment and disposal (including color coding)- BMW Management & methods of disinfection - Modern technology for handling BMW
<b>Unit-4 Safety in Laboratories</b> <span style="float: right;"><b>8 hours</b></span>
Safety in Laboratories – General safety measures, biosafety precautions, levels of biosafety laboratories:BSL1,BSL2,BSL3,BSL4,BSL5,
<b>Unit-5 Ethical Considerations &amp; Quality Control</b> <span style="float: right;"><b>9 hours</b></span>
Non- maleficence, beneficence, risk minimization ,ethical review ,transmission of ethical values, voluntariness, compliance. Quality Assurance –Internal and external Quality assessment
<b>Unit – 6 Recent advancements in emergency care</b> <span style="float: right;"><b>8 hours</b></span>
Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR, Using an AED (Automated external defibrillator) & Managing an emergency including moving a patient.

#### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Research Methodology & Biostatistics			
<b>Course Code</b>	BMLT6003			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	3	0	0	3

### Course Objectives:

- 1.To gain the basic knowledge of Research Methodology & Biostatistics
- 2.To know the basic principles of research and methods applied in applied to draw inferences from the research findings.
- 3.To make use of statistical methodology in designing, analysing, interpreting, and presenting biological experiments and observations.

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Illustrate the basic principles of research
<b>CO2</b>	Interpret the research findings.
<b>CO3</b>	Illustrate the basic of statistical methods
<b>CO4</b>	illustrate the basic of biostatistics and research tools
<b>CO5</b>	Apply research knowledge in presenting biological research
<b>CO6</b>	Adapt and understand recent advancements in epidemiology

### Text Book (s)

- 1.The Analysis of Biological Data (2nd edition) by Whitlock & Schluter
- 2.Text Book of Biostatistics and Research methodology by Karthikeyan,R.M  
.Chaturvedi,R.M.Bhosale

### Reference Book (s)

- 3.Textbook of Methods in Biostatistics by B.K.Mahajan 7th Edition
- 4.Textbook of Biostatistics by B.Annadural

<b>Unit-1</b>	<b>8 hours</b>
Introduction to research methods , Identifying research problem	
<b>Unit-2</b>	<b>8 hours</b>
Ethical issues in research, Research design	
<b>Unit-3</b>	<b>7 hours</b>
Basic Concepts of Biostatistics, Types of Data, Research tools and Data collection methods	
<b>Unit-4</b>	<b>8 hours</b>
Sampling methods, Probability rules & Probability distributions (Normal & Binomial)	
<b>Unit-5 Ethical Considerations &amp; Quality Control</b>	<b>9 hours</b>
Developing a research proposal-Models	
<b>Unit – 6 Recent advancements in epidemiology</b>	<b>8 hours</b>
Basics of evidence based evidence, types of studies, causal inference in epidemiology, applied epidemiology	

### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Medical Laboratory Technician-II			
<b>Course Code</b>	BMLT6004			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	6	0	0	6

### Course Objectives:

- 1.To train the students for the job of a “Medical Laboratory Technician” , in the “Healthcare” Sector/Industry
- 2.To develop knowledge and skill related to Medical Laboratory Technician

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Explain Patient’s Rights & Responsibilities and demonstrate chemicals/reagents useful in sample collection & analysis, broad understanding of maintaining record of inventory, test results in cytopathology and histopathology laboratory
<b>CO2</b>	Practice Good Clinical Laboratory Practices (GCLP) of WHO, laboratory safety, OSHA (Occupational Safety and Health Administration), U.S. Department of Labor, other current practices in laboratory used worldwide
<b>CO3</b>	Differentiate the Morphology, pathogenicity and laboratory diagnosis of human viruses and illustrate fine needle aspiration
<b>CO4</b>	Post-Analytical Laboratory Testing Process and patients environment.
<b>CO5</b>	Practice Soft Skills and effective Communications with Patients &Family
<b>CO6</b>	Discuss laboratory Information system, calibration of laboratory instruments & management of financial, biomedical waste in hospital.

### Text Book (s)

- 1 Text book of Biochemistry by U. Satyanarayana
- 2 Text book of Medical Laboratory Technology by Godkar
- 3 Textbook of Parasitology by CP. Baveja
- 4 Essentials of Physiology by Sembulingam
- 5 Textbook of Pathology by Harshamohan
- 6 Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone

### Reference Book (s)

1. Textbook of Microbiology By Prescott
2. Textbook of Hematology & Clinical pathology by Ram das naik
3. Textbook of Immunology by S.K gupta
4. WHO : Good Clinical Laboratory Practice (GCLP),2009
5. Hand book of Health care quality & patient safety

<b>Unit-1</b>	<b>26 hours</b>
<p>Patient's Rights &amp; Responsibilities: Understand sensitivities involved in patient's right, Learn medical laboratory technician's role in maintaining patient's rights.</p> <ul style="list-style-type: none"> <li>• Introduction to Histopathology: Brief introduction of histopathology, Elementary knowledge of specimen collection, tissue fixatives, Tissue processing, section cutting, Staining, Decalcification.</li> <li>• Introduction to Cytopathology: Elementary knowledge of specimen collection, transportation, precautions to be taken for gynaecological samples, specimen collection, transportation and preservation of nongynaecological Samples, fixation and fixative, fluid specimen, Papanicolaou stain, mounting of cell sample, special stains.</li> <li>• Analytical Laboratory Testing Process-II: To gain broad understanding of chemicals/reagents useful in sample analysis, broad understanding of maintaining record of inventory, test results, etc. Able to inspect the availability of medical supplies or diagnostic kits, laboratory safety. to research methods , Identifying research problem</li> </ul>	
<b>Unit-2</b>	<b>21 hours</b>
<p>Introduction to Advanced techniques and future trends in laboratory science-I: Updated on advanced techniques and future trends in field of biochemistry, haematology &amp; blood banking, field of clinical pathology, histopathology &amp; cytopathology.</p> <ul style="list-style-type: none"> <li>• Sensitization on current best practices in laboratory: Elementary knowledge on Good Clinical Laboratory Practices (GCLP) of WHO, laboratory safety, OSHA (Occupational Safety and Health Administration), U.S. Department of Labor, other current practices in laboratory used worldwide.</li> <li>• Infection control and prevention: Understand practices to curb infection, hospital borne infections, prevention and treatment of needle, stick injury, management of blood and body, substance spills in the health care setting</li> </ul>	
<b>Unit-3</b>	<b>26 hours</b>
<p>Fine needle Aspiration: Understand the purpose of fine needle aspiration, procedure of fine needle aspiration, &amp; section cutting</p> <ul style="list-style-type: none"> <li>• Introduction to Parasitology, Mycology and Virology, Describe the Morphology, pathogenicity and laboratory diagnosis of human viruses.</li> <li>• Basic Computer Knowledge: To gain broad understanding about Application of computers in laboratory Practice, Introduction to Computers, Block diagram, Input and Output devices, Storage devices, operating systems, Operating systems (OS), Function of OS, MS-Office</li> </ul>	
<b>Unit-4</b>	<b>23 hours</b>
<ul style="list-style-type: none"> <li>• Post-Analytical Laboratory Testing Process: Describe archiving protocol emphasizing on storage and retrieval of samples, specimens, data, and records. Archiving, Describe source of error/ interference/ quality of work and initiate corrective action as applicable, assessment of results to initiate followup, testing, Differentiation between clinically, Significant and insignificant findings, Able to establish and monitor quality assurance, programs or activities to ensure the accuracy of laboratory results</li> <li>• Patient's Environment: Describe things necessary to make the patient feel safe and comfortable while collection, impact of comfort on patients health, importance and methodology of cleanliness, and hygiene environment in collection space</li> </ul>	
<b>Unit-5 Ethical Considerations &amp; Quality Control</b>	<b>24 hours</b>
<p>Soft Skills and Communications Theory Duration: Understand Art of Effective Communication, Able to handle effective Communication with, Patients &amp; Family, Able to handle effective Communication with Peers/ colleagues using medical terminology in communication, reading and writing skills, sentence formation, grammar and composition, enhance vocabulary, Goal setting, team building, team work, time, management, thinking and reasoning &amp; communicating with others, problem solving, Understand need for customer service and service excellence in Medical service, ethics in hospital set up, objection handling, Telephone and Email etiquettes, Basic computer working like feeding the data, saving the data and retrieving the data, analyse, evaluate and apply the information gathered from observation, experience, reasoning, or communication to act efficiently; rapidly changing situations, adapt accordingly, decision making ability, planning and organization of work</p>	
<b>Unit – 6 Advancements in Laboratory Information system (LIS) 8 hours</b>	

Laboratory Information system (LIS), Hospital Information system (HIS) and financial Management: Introduction, Functions of a laboratory management system, Standards for laboratory management system, Introduction and awareness of financial management in a clinical laboratory. Ethics in Medical laboratory Practice: Understanding the term \_Ethics, Ethics in relation to the following: Pre-Examination procedures, Examination procedures, Reporting of results, Preserving medical records, Access to Medical laboratory Records. Procurement of equipment and Inventory Control: Audit in a Medical Laboratory, Introduction and Importance: Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation.

### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Phlebotomy-II			
<b>Course Code</b>	BMLT6005			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	6	0	0	6

### Course Objectives:

- 1.To gain the basic knowledge on role of “phlebotomy technician ” in the “Healthcare Sector/Industry”
- 2.To practice the Biomedical waste management
- 3.To develop knowledge and skill related to “phlebotomy technician”
4. To develop the knowledge role of phlebotomy technician in Pre-Analytical laboratory testing process

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Understanding role of the phlebotomy technician.
<b>CO2</b>	Perform blood collection in laboratory and blood bank.
<b>CO3</b>	Apply knowledge on biomedical waste.
<b>CO4</b>	Perform pre analytical procedure in laboratory
<b>CO5</b>	Understanding reporting and documentation.
<b>CO6</b>	Improve skills on collection of blood by using advanced techniques

### Text Book (s)

1. Text book of Medical Laboratory Technology by Godkar
2. Medical Laboratory Technology by Mukherjee
3. Essentials of Physiology by Sembulingam
4. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone

### Reference Book (s)

<b>Unit-1 Role of the Phlebotomy Technician</b>	<b>26 hours</b>
To develop broad understanding of the Role of PBT. To identify Laboratory maintenance needs to be taken care by PBT. To develop Understanding of Patient Comforts and Safety. To develop understanding of Laboratory Test Results. To exhibit Ethical Behaviour	
<b>Unit-2 Blood Collection in lab and blood bank.</b>	<b>21 hours</b>
Types, composition, action of anticoagulants. Anticoagulants used in blood bank and clinical laboratory. Blood collection procedure in laboratory, Blood collection in Blood bank. Blood collection method.	
<b>Unit-3 Bio Medical Waste Management</b>	<b>26 hours</b>
To gain understanding of importance of proper and safe disposal of bio-medical waste & treatment. To gain understanding of categories of biomedical waste. To learn about disposal of bio-medical waste colour coding, types of containers, transportation of waste, etc. To gain broad understanding of standards for bio-medical waste disposal To gain broad understanding of means of biomedical waste treatment.	
<b>Unit-4 Pre-analytical Laboratory Testing Process</b>	<b>23 hours</b>
To gain broad understanding of different types of samples to be taken in medical laboratory. To gain broad understanding about Sample Handling. To gain broad understanding of different equipment useful for blood sample collection. To gain broad understanding of correct method of interpretation of test request forms.	
<b>Unit-5 Observing, Reporting &amp; Documentation:</b>	<b>24 hours</b>
Understand the importance and method of observing and reporting while dealing with patients during sample and report collection. Describe quality assurance process during report delivery. Understanding the importance of verbally informing the person in authority. Understand guidelines for documentation. understand uses and importance of records in laboratory	
<b>Unit-6 Advancements in automation the field of phlebotomy</b>	<b>8 hours</b>
Adaptations for fragile veins, Recognizing and adapting to damaged veins	

### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
10	20	70	100

<b>Name of The Course</b>	Medical Laboratory Technician lab -II			
<b>Course Code</b>	BMLT6051			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	6	3

### Course Objectives:

- 1.To demonstrate the ability to perform clinical skills essential in providing basic diagnostic services such as Correctly collect, transport, receive, accept or reject and store blood/urine/stool and tissue samples, etc.
2. To conduct analysis of body fluids/ samples; Maintain, operate and clean laboratory equipment
- 3.To provide technical information about test results; Prepare and document medical tests and clinical results; etc.

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Demonstrate working of various instruments used and laboratory process and formats in Medical Laboratory Technology Laboratory.
<b>CO2</b>	Demonstrate automation and quality control in Medical Laboratory Technology Lab.
<b>CO3</b>	Diagnose different diseases and report it.
<b>CO4</b>	Demonstrate and apply computers and its applications in laboratory field.

### Text Book (s)

1. Text book of Medical Laboratory Technology by Godkar
2. Damodaran K, Practical Biochemistry
3. Textbook of Parasitology by CP. Baveja
4. Anatomy for Nurses By Asha Latha
5. Textbook of Pathology by Harshamohan
6. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone

### Reference Book (s)

1. Textbook of Microbiology By Presscott
2. Textbook of Pathology by Harshamohan
3. Textbook of Hematology & Clinical pathology by Ram das naik
4. Textbook of Immunology by S.K Gupta
5. U.Satyanarayana, Textbook of Medical Biochemistry
6. Hand book of Health care quality & patient safety



### List of Experiments

1. Demonstration of working of spectrophotometer
2. Demonstration of maintenance of equipment's and reagents
3. Sample formats for reporting test result
4. Demonstration of policies and procedures for infection control
5. Demonstration of mock diagnostic lab for learning & understanding patients right
6. Demonstration of mock environment to learn and understand conducive patient environment
7. Collection and handling of specimen for histopathology/cytopathology examination
8. Demonstration of working of Microtome
9. Demonstration of sharpening methods of microtome knife
10. Demonstration of tissue processing
11. Demonstration of PAP staining
12. Demonstration of PAS staining
13. Collection and handling of specimen for cytopathology examination
14. Demonstration of Mounting technique
15. Demonstration of maintaining record of inventory, test results etc
16. Demonstration of automation in clinical biochemistry laboratory
17. Demonstration of automation in hematology laboratory
18. Demonstration of automation in pathology laboratory
19. Demonstration of automation in microbiology laboratory
20. Demonstration of FNAC
21. Demonstration of laboratory diagnosis of HIV
22. Demonstration of laboratory diagnosis of HCV
23. Demonstration of maintenance of IQA
24. Demonstration of maintenance of EQA
25. Demonstration of advanced techniques in the field of Molecular biology
26. Demonstration of Computer and its applications
27. Demonstration of operating systems
28. Demonstration of MS –Word
29. Demonstration of MS-Excel

### Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
30		70	100

<b>Name of The Course</b>	Phlebotomy lab -II			
<b>Course Code</b>	BMLT6053			
<b>Prerequisite</b>				
<b>Corequisite</b>				
<b>Antirequisite</b>				
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	0	0	6	3

### Course Objectives:

- 1.To gain the practical skill of “phlebotomy technician ” in collecting ,receiving and preparing patient for blood collection.
- 2.To practice the Biomedical waste management
3. To develop the knowledge role of phlebotomy technician in Pre-Analytical laboratory testing process

### Course Outcomes

On completion of this course students will be able to:

<b>CO1</b>	Apply his knowledge and explain role of phlebotomy technician.
<b>CO2</b>	Perform collection, handling, transport of blood and urine samples
<b>CO3</b>	Perform collection, Handling ,patient care after blood collection in blood bank

### Text Book (s)

1. Text book of Medical Laboratory Technology by Godkar
2. Medical Laboratory Technology by Mukherjee
3. Essentials of Physiology by Sembulingam

### Reference Book (s)

#### List of experiments

1. Good laboratory practices
2. Demonstration of role of the phlebotomy technician.
3. Demonstration of Blood collection methods.
4. Demonstration of blood collection in blood bank.
5. Demonstration of types and action of anti-coagulents in Laboratory and blood bank
6. Demonstration of biomedical waste color coding.
7. Demonstration of collection and transport of urine sample.
8. Demonstration of patient care after blood collection
9. Demonstration of sample labelling in clinical laboratory and blood bank.

### Continuous Assessment Pattern

<b>Internal Assessment (IA)</b>	<b>Mid Term Test (MTE)</b>	<b>End Term Test (ETE)</b>	<b>Total Marks</b>
30		70	100

<b>BMLT7001</b>	Professional Training	L	T	P	C
Version	Date of Approval:	0	0	40	20
Pre-requisites//Exposure					
Co-requisites					

### **Medical Lab Technology Internship Programme :**

All the students shall undergo Internship for a period of one year under the supervision of Lab superintendent/Lab incharge/Pathologist at Super specialty/Multi specialty- hospitals/Diagnostic & research Centers of repute, work in the areas of Clinical Biochemistry, Microbiology, Immunology & serology, Blood bank and Molecular Techniques, Pathology, Histopathology, Hematology and Sample collection, processing and rejection.

**Duration:** Internship is for 12 months (July – December; January – June) or 1 year. (6 days / week; 6 hours / day) A minimum of 720 hours /semester (If 120 days working days).

### **Course Objectives:**

**During this period the interns would gain knowledge and exposure in the following domains-**

- Perform clinical skills essential in providing basic diagnostic services such as Correctly collect, transport, receive, accept or reject and store blood /urine/stool and tissue samples, etc.; Conduct analysis of body fluids/ samples; Maintain, operate and clean laboratory equipment; Provide technical information about test results; Prepare and document medical tests and clinical results; etc.
- Explain quality assurance in Laboratory works
- Practice infection control measures
- Advanced knowledge of the scientific principles on which the tests and equipment function.
- Ensure readily availability of medical and diagnostic supplies
- Demonstrate techniques to maintain the personal hygiene needs
- Demonstrate actions in the event of medical and facility emergencies
- Exhibit professional behavior, personal qualities and characteristics of a Medical laboratory Technician
- Demonstrate good communication, communicate accurately and appropriately in the role of Medical laboratory Technician

### **Submission:**

1.A log book must be maintained for day to day activities and signed by Lab superintendent or Lab incharge ,HoD of department on each semester end.

2. Project work completed with prior approval every semester end presented in End term external exam.

**Examination:**

At the end of each semester assessment made by external experts as per the university guidelines and evaluation made accordingly.

**Evaluation Scheme:**

<b>Internal Assessment (IA)</b>	<b>CAT</b>	<b>End Term Exam (ETE)</b>	<b>Total Marks</b>
		100	100

Version	Date of Approval:	0	0	40	20
Pre-requisites/Exposure					
Co-requisites					

### **Medical Lab Technology Internship Programme :**

All the students shall undergo Internship for a period of one year under the supervision of Lab superintendent/Lab incharge/Pathologist at Super specialty/Multi specialty- hospitals/Diagnostic & research Centers of repute, work in the areas of Clinical Biochemistry, Microbiology, Immunology & serology, Blood bank and Molecular Techniques, Pathology, Histopathology, Hematology and Sample collection, processing and rejection.

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- Explain quality assurance in Laboratory works
- Practice infection control measures
- Advanced knowledge of the scientific principles on which the tests and equipment function.
- Ensure readily availability of medical and diagnostic supplies
- Demonstrate techniques to maintain the personal hygiene needs
- Demonstrate actions in the event of medical and facility emergencies
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**Examination:**

At the end of each semester assessment made by external experts as per the university guidelines and evaluation made accordingly.

**Evaluation Scheme:**

Internal Assessment (IA)	CAT	End Term Exam (ETE)	Total Marks
		100	100