



GALGOTIAS UNIVERSITY

Syllabus of

B.Sc. Medical Laboratory Technology

Name of School: School of Medical and Allied Sciences

Department: Medical Laboratory Technology

Year: 2016-2017

B.Sc.Medical Laboratory Technology**2016-17--Programme Structure****Sem I**

Course Code	Subject	L	T	P	C
MLT 101	General Anatomy-I	3	0	0	3
MLT 102	General Physiology –I	3	0	0	3
MLT 103	Biochemistry-I	3	0	0	3
EVS 102	Energy & Environmental Sciences	3	0	0	3
MLT 151	General Anatomy-I (P)	0	0	2	1
MLT 152	General Physiology-I (P)	0	0	2	1
MLT 153	Biochemistry-I (P)	0	0	2	1
	TOTAL				15

Sem II

Course Code	Subject	L	T	P	C
MLT 104	General Anatomy and Physiology	3	0	0	3
MLT 105	General Pathology and Microbiology	3	0	0	3
MLT 106	Hematology	3	0	0	3
MLT 107	Medical Biochemistry	3	0	0	3
MLT 108	Computer Fundamentals	3	0	0	3
MLT 154	General Pathology and Microbiology (P)	0	0	2	1
MLT 155	Hematology(P)	0	0	2	1
MLT 156	Medical Biochemistry(P)	0	0	2	1
MLT 157	Computer Fundamentals(P)	0	0	2	1

	TOTAL				19
Sem III					
Course Code	Subject	L	T	P	C
MLT 201	Blood Bank Procedures Hemoglobinopathies-I	3	0	0	3
MLT 202	Endocrinology, Tumor & Cancer Markers-I	3	0	0	3
MLT 203	Clinical Biochemistry-I	3	0	0	3
MLT 204	Parasitology	3	0	0	3
ENG 131	Communicative English-I	2	0	0	2
MLT 251	Blood Bank Procedures Hemoglobinopathies-I (P)	0	0	2	1
MLT 252	Endocrinology, Tumor & Cancer Markers-I(P)	0	0	2	1
MLT 253	Clinical Biochemistry-I (P)	0	0	2	1
ENG 181	Communicative English-I (P)	0	0	2	1
	TOTAL				18
Sem IV					
Course Code	Subject	L	T	P	C
MLT 205	Blood Bank Procedures & Hemoglobinopathies-II	3	0	0	3
MLT 206	Endocrinology, Tumor & Cancer Markers-II	3	0	0	3
MLT 207	Clinical Biochemistry-II	3	0	0	3
MLT 208	Virology	3	0	0	3
ENG 231	Communicative English-II	2	0	0	2
MLT 254	Endocrinology, Tumor & Cancer Markers-II(P)	0	0	2	1
MLT 255	Clinical Biochemistry-II (P)	0	0	2	1
ENG 281	Communicative English-II(P)	0	0	2	1
	TOTAL				17
Sem V					
Course Code	Subject	L	T	P	C
MLT 301	Mycology	3	0	0	3
MLT 302	Systemic Bacteriology	3	0	0	3
MLT 303	Histopathology	3	0	0	3
MLT 304	Medical Laboratory Technician-I	8	0	0	8
MLT 351	Mycology(P)	0	0	2	1
MLT 352	Systemic Bacteriology(P)	0	0	2	1

MLT 353	Histopathology (P)	0	0	2	1
MLT 354	Medical Laboratory Technician-I	0	0	6	3
	TOTAL				23
Sem VI					
Course Code	Subject	L	T	P	C
MLT 305	Cytopathology	3	0	0	3
MLT 306	Immunology&Serology	3	0	0	3
MLT 307	Biostatistics&Research Methodology	3	0	0	3
MLT 308	Clinical Laboratory Practice	3	0	0	3
MLT 309	Medical Laboratory Technician-II	8	0	0	8
MLT 357	Cytopathology(P)	0	0	2	1
MLT 355	Immunology&Serology (P)	0	0	2	1
MLT356	Medical Laboratory Technician-II(P)	0	0	6	3
	TOTAL				25
Sem VII					
Course Code	Subject	L	T	P	C
MLT 401	Professional Training	0	0	40	20
	(6MONTHS)				
	TOTAL				20
Sem VIII					
Course Code	Subject	L	T	P	C
MLT 402	Professional Training	0	0	40	20
	(6MONTHS)				
	TOTAL				20
	TOTAL				157

EVS-102	Energy and Environmental Sciences	L	T	P	C
Version 1.1	Date of Approval:	3	0	0	3
Pre-requisites/Exposure	NA				
Co-requisites					

Course Objectives

To develop awareness about our environment.

To develop a concern about sustainable development.

Course Outcomes

The students will be able to understand the followings:-

Understand About environment and its components and Problems associated with natural

resources and their sustainable use

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.

Understanding about social issues.

Understanding of role of information technology to address environmental issues.

Application of sustained Chemistry.

Catalogue Description

The students will understand the objective of environmental studies and importance of natural resources conservation. They will realize the effect of toxic chemicals available in the environment. The students will learn about the sources, effects and control measures of air, water, soil, noise, thermal pollution. They will also be made aware of natural disaster management. The students will understand the need of sustainable development, environment laws, role of information technology in the environment. The students will be explained basic principles of green Chemistry and concept of atom economy.

Text Books

Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.

Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5

Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005, ISBN: 978 81 7371 540 2

Environmental Studies (From Crisis to Cure) Second Edition. , R. Rajagopalan, Oxford University Press, 2012, ISBN 0-19-807208-2.

Environmental Studies, Ranu Gadi, Sunitta Rattan, Sushmita Mohapatra, S.K. Kataria and Sons , 2008, ISBN: 81-89757-98-9.

Reference Books/ Other Study material

Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.

Environmental Studies, Anindita Basak, Pearson Education, 2009, ISBN: 978-81-317-2118-6.

Principles of Environmental Science (Inquiry and Applications), William P. Cunningham & Mary Ann Cunningham, Tata McGraw Hill Education Private Limited, 2007, ISBN: 987-0-07-064772-0.

Course Content

Unit I: Environment & Natural Resources

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.

Unit II: Chemical Toxicology

Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides

Unit III: Environmental Pollution

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.

Unit IV: Social Issues, Human Population and the Environment

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.

Unit V: Green Chemistry

Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.

Mode of evaluation: The theory and lab performance of students are evaluated separately.

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Understand About environment and its components and Problems associated with natural resources and their sustainable use	7, 12
2	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.	7, 12
3	Understanding about social issues.	7, 12
4	Understanding of role of information technology to address environmental issues.	7, 12
5	Application of sustained Chemistry.	7, 12

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
EVS102	Energy and Environmental Sciences							3					1

1=addressed to small extent

2= addressed significantl

3=major part of course

LLL101	Universal Human Values and Ethics	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

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

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the value of harmonious relationship based on trust and respect in their life and profession
4. Understand the role of a human being in ensuring harmony in society and nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Books

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

Reference Books

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.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Course Content

Module 1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

Module II Understanding Harmony in the Human Being - Harmony in Myself

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya

Module III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
15. Understanding the meaning of *Vishwas*; Difference between intention and competence
16. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
18. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*) - from family to world family!

Module IV Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

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

Module V Implications of the above Holistic Understanding of Harmony on Professional Ethics

- 23. Natural acceptance of human values
- 24. Definitiveness of Ethical Human Conduct
- 25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

- 26. 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
- 27. Case studies of typical holistic technologies, management models and production systems
- 28. 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

Mode of Evaluation: The theory performance of students is evaluated separately as

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes

1	<p>1.Understand the significance of value inputs in a classroom and start applying them in their life and profession</p> <p>2.Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.</p> <p>3.Understand the value of harmonious relationship based on trust and respect in their life and profession</p> <p>4.Understand the role of a human being in ensuring harmony in society and nature.</p> <p>5.Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.</p>	12
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		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
LLL 101	Universal Human Values and Ethics												2

1=Addressed to small extent
2=Addressed significantly
3=Major part of course

MLT 101	General Anatomy-I	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic human anatomy and its functions.

Course Outcomes

On completion of this course, the students will be able to understand anatomy of different body systems and functions exhibited by these systems in our body.

Catalog Description

This subject involves study of human body, locomotion and support, histological features of various body systems – cardiovascular, GIT, respiratory, endocrine etc.

Text Books

1. William Davis, *Understanding Human Anatomy and Physiology*, McGraw Hill
2. Chaurasia's, *A Text Book of Anatomy*
3. Ranganathan, T.S., *A Text Book of Human Anatomy*

Reference Books

1. Fattana, *Human Anatomy*, (Description and Applied), Saunder's & C P Prism Publishers, Bangalore
2. Ester. M. Grishcimer, *Physiology & Anatomy with Practical Considerations*, J.P. Lippin Cott. Philadelphia.

Course Content

Module I

Introduction: Human body as a whole

Definition of anatomy and its divisions, Terms of location, positions and planes, Cell and its organelles, Epithelium-definition, classification, describe with examples, function, Glands classification, describe serous & mucous glands with examples, Basic tissues – classification with examples.

Module II

Locomotion and Support

Cartilage – types with example & histology, Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of bones, vertebral column, inter vertebral disc, fontanelles of fetal skull, Joints – Classification of joints with examples, synovial joint (in detail for radiology), Muscular system- Classification of muscular tissue & histology, Names of muscles of the body.

Module III

Cardiovascular System

Heart-size, location, chambers, exterior & interior, Blood supply of heart, Systemic & pulmonary circulation, Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse, Inferior venacava, portal vein.

Module IV

Gastro-intestinal System

Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, Radiographs of abdomen.

Module V

Respiratory System

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments, Histology of trachea, lung and pleura, Names of paranasal air sinuses.

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand anatomy of different body systems and functions exhibited by these systems in our body.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
1	5	Professional Identity
2	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
2	11	Modern & Usage
	12	Life-long Learning

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 102	General Physiology-I	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

The basic objective of this course is to get familiar with human physiology.

Course Outcomes

On completion of this course, the students will be able to understand-scope and importance of cell, physiological laws, blood groups, blood transfusion and fundamentals of different organ systems.

Catalog Description

This is an important subject of Medical Laboratory Technology. It deals with importance of cell and organelles, cell division, physio-chemical laws applied to physiology, blood cells and blood grouping. This subject also deals with blood groupings, blood transfusion, blood indices, transfusion anticoagulant and various blood counts.

Text Books

1. A.K Jain, Human Physiology
2. Chatterjee, C C, Human Physiology, Medical Allied Agency

Reference Books

1. Guyton, Arthur, Text Book of Physiology, Prism Publishers
2. Chatterjee, C C, Human Physiology, Medical Allied Agency

Course Content

Module 1:Cell

Definition, Structure and function of Cytoplasmic Organelles, Reproduction-Meosis, Mitosis.

Module 2: The important physico-chemical laws applied to physiology

Diffusion, Osmosis, Bonding, Filtration, Dialysis, Surface Tension, Adsorption, Colloid.

Module 3: Introduction- composition and function of blood

Red blood cells- Erythropoiesis, stages of differentiation function, counts physiological Variation. Haemoglobin -Structure, function, concentration physiological variation. Methods of Estimation of Hb, White blood cell- Production, function, life span, count, differential count. Platelets- Origin, normal count, morphology functions. Plasma Proteins- Production, concentration, types, albumin, globulin, fibrinogen, Prothrombin functions. Haemostasis &

Blood coagulation. Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting disorders of clotting factors. Blood Bank, Blood groups-A, B, O system, Rh system

Module 4

Circulation: General principles Heart: myocardium – innervation – transmission of cardiac impulse Events during cardiac cycle – cardiac output. Peripheral circulation: peripheral resistances – arterial blood pressure – measurements – factors regulation variations – capillary circulation – venous circulation. Special circulation: coronary cerebral – miscellaneous.

Module 5

Respiration: Mechanics of respiration – pulmonary function tests – transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea – asphyxia. Excretion: Body fluids – distribution, measurement & exchange, Kidney – structure of nephron – mechanism of urine formation – composition of the urine and abnormal constituents – urinary bladder & micturition

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand-scope and importance of cell, physiological laws, blood groups, blood transfusion and fundamentals of different organ systems.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
1	5	Professional Identity
2	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
2	11	Modern & Usage
	12	Life-long Learning

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 103	Biochemistry	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic biochemistry

Course Outcomes

On completion of this course, the students will be able to understand Structure, function and interrelationship of biomolecules and consequences of deviation from normal. Integration of the various aspects of metabolism, and their regulatory pathways.

Catalog Description

This course will be taught in two consecutive semesters. Biochemistry I deals with the biochemical nature of carbohydrates, proteins, minerals, vitamins, lipids etc. A detailed study of these, emphasizing on their chemical composition and their role in metabolism is the required aim of this course.

Text Books

1. S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D.R. Whikehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

Reference Books

1. Varley, *Clinical Chemistry*
2. Teitz, *Clinical Chemistry*
3. Kaplan, *Clinical Chemistry*

Course Content

MODULE I

Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)

MODULE II

Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)

MODULE III

Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane

MODULE IV

Vitamins: General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties)

MODULE V

Minerals: Na, K, Ca, P, Fe, Cu and Se (requirements, availability and properties)

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Students will be able to understand Structure, function and interrelationship of biomolecules and consequences of deviation from normal, Integration of the various aspects of metabolism, and their regulatory pathways.	1,5,6

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 103	Biochemistry-I	2				2	1						

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 151	General Anatomy-I (Practical)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic human anatomy and its functions.

Course Outcomes

On completion of this course, the students will be able to understand anatomy of different body systems and functions exhibited by these systems in our body.

Catalog Description

This subject involves study of human body, locomotion and support, histological features of various body systems – cardiovascular, respiratory, endocrine, respiratory, urinary system, reproductive organs, skeletal.

Text Books

1. William Davis, *Understanding Human Anatomy and Physiology*, McGraw Hill.
2. Chaurasia's, *Practical of Human Anatomy*.

Reference Books

1. William Davis, *Understanding Human Anatomy and Physiology*, McGraw Hill.
2. Chaurasia's, *Practical of Human Anatomy*.

Course Content

1. Learning of surface landmarks with special emphasis on bones, joints, muscles, and nerves
2. Demonstration through dissected parts, slides, models, charts, etc.
3. Demonstration of dissected parts (upper extremity, lower extremity, thoracic & Abdominal viscera, face and brain)
4. Demonstration of skeleton articulated and disarticulated.
5. Histology of types of epithelium, Histology of serous, mucous & mixed salivary gland.
6. Histology of the types of cartilage, Demo of all bones showing parts, radiographs of normal bones & joints, Histology of compact bone (TS & LS), Demonstration of all muscles of the body, Histology of skeletal (TS & LS), smooth & cardiac muscle.
7. Demonstration of heart and vessels in the body, Histology of large artery, medium sized artery & vein, large vein, Microscopic appearance of large artery, medium sized artery & vein, large vein, pericardium, Histology of lymph node, spleen, tonsil & thymus, Normal chest radiograph showing heart shadows, Normal angiograms.
8. Estimation of haemoglobin in blood, Determination of bleeding time, clotting time, R.B.C,

Count, Total leucocyte count, D.L.C. and E.S.R.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of Electrocardiogram – PQRST waves and their significance.

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand anatomy of different body systems and functions exhibited by these systems in our body.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
2	5	Professional Identity
2	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
2	11	Modern & Usage
	12	Life-long Learning

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 152	General Physiology (Practical)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic human physiology practicals.

Course Outcomes

On completion of this course, the students will be able to understand physiological parameters as White Blood Cell Count, Red Blood Count, Determination of Blood Groups, Leishman's staining and Differential WBC count, Determination of packed cell Volume.

Catalog Description

This subject involves study of human body, Haemoglobinometry, Erythrocyte sedimentation rate [ESR], Calculation of blood indices, Determination of Clotting Time, Bleeding Time, Blood pressure Recording, Auscultation for Heart Sounds, Artificial Respiration, Determination of vital capacity.

Text Books

1. A.K Jain, *Practical Handbook of Human Physiology*.
2. Nageshwari, *Practical Workbook of Human Physiology*.
3. Gupta, *Medical Physiology Made Easy*.

Reference Books

1. A.K Jain, *Practical Handbook of Human Physiology*.
2. Nageshwari, *Practical Workbook of Human Physiology*.
3. Gupta, *Medical Physiology Made Easy*.

Course Content

1. Haemoglobinometry.
2. White Blood Cell Count.
3. Red Blood Count.
4. Determination of Blood Groups.
5. Leishman's staining and Differential WBC count.
6. Determination of packed cell Volume.
7. Erythrocyte sedimentation rate [ESR].
8. Calculation of blood indices.
9. Determination of Clotting Time, Bleeding Time.
10. Blood pressure Recording.
11. Auscultation for Heart Sounds.
12. Artificial Respiration.
13. Determination of vital capacity.
14. Spirometry to measure various lung capacities & volumes, Respiratory rate,

tidalvolume, VC, timed VC, IRV, IC, ERV, EC on Spirometry (demonstration only), auscultation and percussion.

15. Normal ECG

Mode of Evaluation:

The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand physiological parameters as White Blood Cell Count, Red Blood Count, Determination of Blood Groups, Leishman's staining and Differential WBC count, Determination of packed cell Volume.	1,5,6

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
2	5	Professional Identity
2	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
ML T 152	General Physiolog y	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 153	Biochemistry-I (Practical)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

The basic objective of this course is to get familiar with Medical Biochemistry practicals.

Course Outcomes

On completion of this course, the students will undergo Analysis of Normal Urine, Liver Function tests, Lipid Profile test.

Catalog Description

This is an important subject of Medical Lab Technology. It deals with importance of Renal Function test, Blood gas and Electrolytes, Demonstration of Glucometer with strips, Analysis of Normal Urine, Liver Function tests, Lipid Profile test.

Text Books

1. Varley, *Clinical Chemistry*.
2. Kaplan, *Clinical Chemistry*.
3. Das, Debajyothi, *Biochemistry*, Academic, Publishers, Calcutta.
4. Chatterjee, *A Text book of Medical Biochemistry*.
5. Satyanarayan,U., *Medical Biochemistry*.

Reference Books

1. Varley, *Clinical Chemistry*.
2. Kaplan, *Clinical Chemistry*.
3. Das, Debajyothi, *Biochemistry*, Academic, Publishers, Calcutta.
4. Chatterjee, *A Text book of Medical Biochemistry*.
5. Satyanarayan,U., *Medical Biochemistry*.

Course Content

1. Analysis of Normal Urine.
2. Liver Function tests.
3. Lipid Profile.
4. Renal Function test.
5. Blood gas and Electrolytes.
6. Demonstration of Glucometer with strips.
7. Reactions of monosaccharides, disaccharides and starch:
8. Glucose, Fructose, Galactose, Maltose, lactose, Sucrose
9. Starch Analysis of Unknown Sugars:
10. Estimation: Photometry Biofluid of choice – blood, plasma, serum
Standard graphs Glucose, Proteins, Urea, Creatinine, Bilirubin.

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	The students will understand Analysis of Normal Urine, Liver Function tests, Lipid Profile test.	1,5,6,11

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 153	Biochemistry-I (Practical)	2				2	2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 104	General Anatomy and Physiology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic human anatomy, physiology and its functions.

Course Outcomes

On completion of this course, the students will be able to understand anatomy of different body systems and functions exhibited by these systems in our body and fundamentals of different organ systems.

Catalog Description

This subject involves study of human body, histological features of various body systems – Urinary system, Endocrine, Nervous system, sensory organs , blood grouping etc.

Text Books

1. William Davis, *Understanding Human Anatomy and Physiology*, McGraw Hill
2. Chaurasia's, *A Text Book of Anatomy*
3. Ranganathan, T.S., *A Text Book of Human Anatomy*

Reference Books

1. Fattana, *Human Anatomy*, (Description and Applied), Saunder's & C P Prism Publishers, Bangalore
2. Ester. M. Grishcimer, *Physiology & Anatomy with Practical Considerations*, J.P. Lippin Cott. Philadelphia
3. Guyton, Arthur, *Text Book of Physiology*, Prism Publishers
4. Chatterjee, C C, *Human Physiology*, Medical Allied Agency.

Course Content

Module I

Urinary System

Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder.

Module II:

Endocrines system: Hormone mechanism – negative feed backs – tropic action – permissive action – cellular action, hypothalamic regulation Thyroid - hormones, actions, regulations Adrenal cortex - hormones, actions, regulations Adrenal medulla – hormones, actions, regulations Parathyroid - hormones, actions, regulations Islets of pancreas – hormones, actions, regulations Miscellaneous hormones, actions, regulations Common clinical disorders

Module III

Nervous System

Neuron, Classification of NS, Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Cranial nerves, Sympathetic trunk & names of parasympathetic ganglia.

Module IV

Blood grouping & typing, Cross-matching, Rh system-Rh factor, Rh in Cross-matching, Blood transfusion – Indication, universal donor and recipient concept. Selection criteria of a blood donor. Transfusion Anticoagulant – Classification, Examples and uses.

Module V

Sensory Organs

Skin: Skin-histology, Appendages of skin, Eye: Parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply, Ear: parts of ear- external, middle and inner ear and contents

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand anatomy of different body systems and functions exhibited by these systems in our body and fundamentals of different organ systems.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
1	5	Professional Identity
2	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
2	11	Modern & Usage
	12	Life-long Learning

**ML
T
104**
**General
Anatomy
and**

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 105	General Pathology & Microbiology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To get familiar with Pathology and Microbiology.

Course Outcomes

On completion of this course students will be able to understand different types of microorganisms, staining, cultivation of microbes and methods of sterilization and brief introduction of Cell Injury and Cellular Adaptations, Inflammation.

Catalog Description

The course deals with the identification, causes of disease to enable prevention of disease. Pharmaceutical microbiology deals with common pathogenic microorganisms, their cultivation methods, sterilization methods, assays. The micro org. causes diseases & contamination the subject deal with all these.

Text Books

1. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
2. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.
3. Gunasekaran P, Lab Manual of Microbiology, New Age Publishers

Reference Books

1. Pelczar & Reid, Microbiology, Tata Mc Graw Hill, Delhi.
2. Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longma
3. Dipiro JL, Pharmacotherapy – A Pathophysiological Approach, Elsevier
4. Difore SH, “Atlas of Normal Histology” Lea & Febiger Philadelphia

Course Content

Module I- Cell Injury and Cellular Adaptations.

Normal Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling. Cell death: types- autolysis, necrosis, apoptosis & gangrene. Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia.

Module II- Inflammation

Basic mechanisms involved in the process of inflammation and repair, Alterations in vascular permeability and blood flow, migration of WBC's mediators of inflammation. Brief outline of the process of repair.

Module III

Microbiology: Introduction & History of Microbiology, Structure of bacterial cell. Classification of microorganisms, Bacteria Morphology & Classification

Module IV-

Microscopy, Different types of stains & techniques, Nutrition, cultivation & isolation of bacteria

Module V- Control of Microbes

Sterilization (Sunlight, Heat, Filtration, Radiation). Disinfection (Alcohols, Aldehydes, Phenols, oxidizing agents, Surface active agents, Metallic salts, Dyes, Gases).

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand different types of microorganisms, staining, cultivation of microbes and methods of sterilization and brief introduction of Cell Injury and Cellular Adaptations, Inflammation.	1,2,3,5,6,8,11,12

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 105	General Pathology & Microbiology	2	3	3		1	2		3			2	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 106	Hematology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To get familiar with hematology

Course Outcomes

On completion of this course students will be able to understand basics of blood and its various disorders, drawing of blood specimen, Blood Cell Morphology, Universal precautions.

Catalog Description

The course deals with the study of iron Deficiency Anemia, Distribution of body Iron, Iron Absorption, causes of iron deficiency, Hemolytic Anemia, Specimen rejection criteria for blood specimen, Hemolysis of blood, Blood collection by skin puncture (Capillary Blood), Arterial puncture.

Text Books

1. Praful Godkar, *Textbook of Medical Laboratory Technology*
2. Dasie Lewis, *Medical Laboratory Technology*

Reference Books

1. Kanai Mukherjee, *Medical Laboratory Technology*
2. Mehendi, *Laboratory Procedure in Haematology*

Course Content

Module I

Introduction of hematology, hematopoiesis, RBC, ESR, PCV, Redcell indices, classification of anemia (Morphology, Etiology) clinical features of anemia.

Module II

Morphological- Macrocytic: Folic acid, Vitamin B12; Normocytic Normochromic: Hemolytic, Aplastic Anemia: Microcytic hypochromic: IDA, Thalassemia, Sideroblastic anemia

Module III

Leukopoiesis, Disorders of WBC: Infectious mononucleosis, AML, ALL, CML, CLL. Hodgkin Lymphoma.

Module IV

Disorders of Hemostasis, Normal hemostasis, platelets, fibrinolytic system. DIC, Bleeding time & Clotting time

Module V

Anticoagulants used in hematology and mode of action, Steps in hematology investigation, Reticulocyte count.

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand basics of blood and its various disorders, drawing of blood specimen, Blood Cell Morphology, Universal precautions.	1,5,6,11

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 106	Hematology	2				1	2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 107	Medical Biochemistry	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

At the end of the course, the student should be able to demonstrate his knowledge and understanding on integration of the various aspects of metabolism, and their regulatory pathways.

Course Outcomes

This course deals with basic biochemistry. It covers biochemistry and clinical biochemistry as well as overview of hormones and metabolism of whole body.

Catalog Description

This course deals with the metabolism that takes place in the human body. It also deals with biochemistry in detail. Clinical estimation as well as the clinical significance of biochemical values is also taught.

Text Books

S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

Reference Books

S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990

D R Whitehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

Course Content

Module I

Hormones and their receptors basic concepts in metabolic regulation with examples, insulin, glucagons and thyroxine

Module II

Metabolism General whole body metabolism (carbohydrates, proteins, lipids)

Module III

Enzymes and co-enzymes

Classification

Properties

Module IV

Clinical Biochemistry Blood sugar, urea, creatinine and Bilirubin, cholesterol etc and significance of their estimation.

Module V- Urine Chemistry, Colorimetry- Principle & It's working, Quality control in clinical biochemistry laboratory.

Mode of Evaluation: The theory and lab performance of students are evaluated separately.

Course Objectives

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1.	Students will understand the biochemistry and clinical biochemistry as well as overview of hormones and metabolism of whole body.												1,5,6
		Medical Lab Technology Knowledge	Thinking Abilities	Planning Abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 107	Medical Biochemistry	2				2	2						

1=Addressed to small extent

2= Addressed significantly

3=Major part of course

MLT 108	COMPUTER FUNDAMENTALS (Theory)	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

The basic objective of this course is to get familiar with computers and programming Language.

Course Outcomes

Students will learn about basics of computer, programming.

Catalog Description

Students will learn about basics of computer, programming.

Text Books

1. Mendhanm J, Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., “Vogel’s Textbook of Quantitative Chemical Analysis”, Pearson Education Asia.
2. Connors K.A., “A Text book of Pharmaceutical Analysis”, Wiley Inter-science.

Reference Books

1. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
2. Alexeyev V. “Quantitative Analysis”. CBS Publishers & Distributors.

Course Content

MODULE I

08

Definition and Overview of Computer, Computer classification, Computer Organization, Computer code, computer classification of Boolean algebra. Input Devices Output devices, Storage devices. Computer Software, Types of software. Overview of Computer Networks, LAN, MAN, WAN, Internet, Intranet, network topology. Internetworking: Bridges, Repeaters and Routers

MODULE II

08

Introduction: Operating system and function, Evolution of operating system, Batch, Interactive, Time sharing and Real Time System. Single User Operating System and Multi-user Operating system, Compare MS-DOS vs. UNIX, Various window features. Internal and External commands in MS-DOS

MODULE III

08

Introduction to MS-OFFICE-2003, word 2003 Document creation, Editing, formatting table handling, mail merge, Excel-2003, Editing, working Retrieval, Important functions, short cut keys used in EXCEL

MODULE IV

08

MS-Power point 2003-Job Profile, Elements of Power point , ways of delivering Presentation, concept of Four P's (Planning , Preparation, Practice and Presentation) ways of handling presentations e.g. creating, saving slides show controls, Adding formatting, animation and multimedia effects. Database system concepts, Data models schema and instance. Database language, Introduction to MS-Access 2003, main components of Access tables, Queries, Reports, Forms table handling, working on Query and use of database

MODULE V

08

Computer applications in Medical studies, uses of Internet in Medical Laboratory Industry

Mode of Evaluation: The theory performance of students is evaluated separately as.

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Students will learn about basics of computer, programming	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
1	5	Professional Identity
2	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
2	11	Modern & Usage
	12	Life-long Learning

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 154	General Pathology & Microbiology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To get familiar with Pathology and Microbiology.

Course Outcomes

On completion of this course students will be able to understand different types of microorganisms, staining, cultivation of microbes and methods of sterilization and brief introduction of Cell Injury and Cellular Adaptations, Inflammation.

Catalog Description

The course deals with the identification, causes of disease to enable prevention of disease.

Pharmaceutical microbiology deals with common pathogenic microorganisms, their cultivation methods, sterilization methods, assays. The micro org. causes diseases & contamination the subject deal with all these.

Text Books

1. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
2. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.
3. Gunasekaran P, Lab Mannual of Microbiology, New Age Publishers

Reference Books

1. Pelczar & Reid, Microbiology, Tata Mc Graw Hill, Delhi.
2. Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longma
3. Dipiro JL, Pharmacotherapy – A Pathophysiological Approach, Elsevier
4. Difore SH, “Atlas of Normal Histology” Lea & Febiger Philadelphia

Course Content

1. Good laboratory procedure in microbiology laboratory
2. To study and understand the mechanism of microscope and handling of microscope. Types of Microscopes.
3. Identification of bacteria by Gram stain
4. Identification of Bacteria by Albert stain
5. Identification of bacteria by Indian ink stain
6. Identification of bacteria by ZN-stain
7. Motility Test By Hanging Drop Technique
8. Perform sterilization by using autoclave
9. Perform sterilization by Hot air oven
10. Preparation of basal media
11. Perform different types of streaking techniques for bacterial culture

Mode of Evaluation: The theory & lab performance is evaluated separately as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1													
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 154	General Pathology & Microbiology	2	3	3		1	2		3			2	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 155	Hematology Practical	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To get familiar with practical aspects of hematology.

Course Outcomes

On completion of this course students will be exposed to Basic requirements for hematology laboratory, Glass wares for Hematology, Equipments for Hematology, Complete Blood Counts study, Determination of Hemoglobin.

Catalog Description

The course deals with the study of Determination of Platelet Count, Determination of ESR by wintrobess, Determination of ESR by Westergren's method Determination of PCV by Wintrobess, Erythrocyte Indices- MCV, MCH, MCHC, Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Text Books

1. Praful Godkar, *Textbook of Medical Laboratory Technology*
2. Dasie Lewis, *Medical Laboratory Technology*

Reference Books

1. Kanai Mukherjee, *Medical Laboratory Technology*
2. Mehendi, *Laboratory Procedure in Haematology*

Course Content

1. Good laboratory practices in hematology laboratory
2. Microscopy
3. Types of anticoagulants used in hematology
4. Collection of blood
5. Preparation of smears
6. DLC
7. TRBC
8. TWBC
9. Platelet count
10. ESR
11. PCV
12. Bleeding time
13. Clotting time
14. Reticulocyte count

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	Study of basic requirements for hematology laboratory, Glass wares for Hematology, Equipments for Hematology, Complete Blood Counts study, Determination of Hemoglobin.												1,5,6,11
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 155	Hematology Practical	2				1	2					2	

1=Addressed to small extent

2=Addressed significantly

MLT 156	Medical Biochemistry(Practical)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

At the end of the course, the student should be able to demonstrate his knowledge and understanding on integration of the various aspects of metabolism, and their regulatory pathways.

Course Outcomes

This course deals with basic biochemistry. It covers biochemistry and clinical biochemistry as well as overview of hormones and metabolism of whole body.

Catalog Description

This course deals with the metabolism that takes place in the human body. It also deals with biochemistry in detail. Clinical estimation as well as the clinical significance of biochemical values is also taught.

Text Books

S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

Reference Books

S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990

D R Whitehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

Course Content

Laboratory organization Instruments, glassware, sample collection & specimen labeling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.

To study general properties of the enzyme (Urease) & Achromatic time of Salivary amylase.

Urine analysis – normal & abnormal constituents of urine.

CSF & Semen Analysis - Gross & Microscopic.

Glucose tolerance test & Glycosylated haemoglobin.

Centrifugation : Principle, types & applications.

Chromatography : Definition, types, RF value, description of paper chromatography & applications.

Uses, Care and Maintenance of various instruments of the laboratory.

Mode of Evaluation: The lab performance of students are evaluated as

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1.	Students will understand the biochemistry and clinical biochemistry as well as overview of hormones and metabolism of whole body.												1,5,6
		Medical Lab Technology Knowledge	Thinking Abilities	Planning Abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 156	Medical Biochemistry Practical	2				2	2						

1=Addressed to small extent

2= Addressed significantly

MLT 157	COMPUTER FUNDAMENTALS (Practical)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

The basic objective of this course is to get familiar with computers and programming Language.

Course Outcomes

Students will learn about basics of computer, programming.

Catalog Description

The basic objective of this course is to get familiar with computers and programming Language.

Text Books

1. Mendham J, Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., “Vogel’s Textbook of Quantitative Chemical Analysis”, Pearson Education Asia.
2. Connors K.A., “A Text book of Pharmaceutical Analysis”, Wiley Inter-science.
3. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
4. Alexeyev V. “Quantitative Analysis”. CBS Publishers & Distributors.

Reference Books

1. Mendham J, Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., “Vogel’s Textbook of Quantitative Chemical Analysis”, Pearson Education Asia.
2. Connors K.A., “A Text book of Pharmaceutical Analysis”, Wiley Inter-science.
3. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
4. Alexeyev V. “Quantitative Analysis”. CBS Publishers & Distributors.

Course Content

Practical to be conducted

Software Lab to be used for the following:-

1. Windows, Managing Windows, Working with Disk , Folders and files.
2. MS-Office 2003 (MS Word, MS Power point, MS Excel, MS Access).
3. Computer Operating System Like DOS and Windows.
4. Internet Features (E-mail, Browser etc.)

Mode of Evaluation: The lab performance of students is evaluated separately as

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	Students will learn about basics of computer, programming	1,5,6,11											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 157	COMPUTER FUNDAMENTALS Practical	2				1	2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

ENG 131	Communicative English -I	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

1. To help the students understand and communicate in English as used in day to day activities.
2. To help the students enhance their competence in the English language.

Course Outcomes

The students will get the required training in LSRW through the prescribed texts and would be:

Able to write simple and meaningful sentences with proper punctuation.

Able to understand words, in isolation and in context

Able to understand instructions, requests and class lectures.

Able to pronounce words correctly in everyday use

Catalog Description

Though, we take students of undergraduate courses to be proficient in English language, we have been proved wrong time and again. The course presented here, is a skill based programme, where we would try to improve all the four skills of the students i.e. LSRW (Listening, Speaking, Reading and Writing). The quest is to improve their understanding and expression so that they are able to do much better in their studies and life as a resultant.

Text Books

Murphy Raymond, Essential English Grammar, Cambridge Uni. Press.

Intermediate English Grammar. Raymond Murphy ISBN NO 978-81-7596-676-5

Essential English Grammar. Raymond Murphy ISBN: 9788175960299

Wallace, Michael J: Study Skills in English, Cambridge University Press, Cambridge, 1980.

Reference Books

Bhatnagar, R.P. & R. Bhargava, Law and language, New Delhi: Macmillan.

Cross, Ian et al. Skills for lawyers, Jordan Publishing Company., 1997 Bristol.

Madabhushi Sridhar, Legal Language, Asia Law House, Hyderabad.

Legal Language and Legal Writing – P.K. Mishra

Course Content

Module	Topics
I	Fundamentals of Communications; Reading Comprehension; Paragraph Development- Techniques Methods; Introduction to Parts of Speech; Subject-Verb Agreement; Time, Tense and Aspects
II	Basic sentence structure, Formal and Functional Analysis of sentences; Prepositions; Letter Writing-Constituents, Formats; Types of Letter (Enquiry, Complaint, Adjustment, Place an Order)
III	Clauses, Active and Passive Voice; Homophones; Homonyms; Non-Verbal Communication; Para linguistics; Group Discussion and Interview

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Able to write simple and meaningful sentences with proper punctuation, to understand words, in isolation and in context, to understand instructions, requests and class lectures	1,2,5,10,11,12

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
EN G 131	Communicative English	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

ENG 181	Communicative English-I (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

1. To help the students understand and communicate in English as used in day to day activities.
To help the students enhance their competence in the English language

Course Outcomes

The students will get the required training in LSRW through the prescribed texts and would be:

- Able to write simple and meaningful sentences with proper punctuation.
- Able to understand words, in isolation and in context
- Able to understand instructions, requests and class lectures.
- Able to pronounce words correctly in everyday use

Catalog Description

Though, we take students of undergraduate courses to be proficient in English language, we have been proved wrong time and again. The course presented here, is a skill based programme, where we would try to improve all the four skills of the students i.e. LSRW (Listening, Speaking, Reading and Writing). The quest is to improve their understanding and expression so that they are able to do much better in their studies and life as a resultant.

Text Books

- Cambridge Grammar for IELTS with answers. ISBN NO 9780521706117
- Byne: Teaching Writing Skills, Longman, London 1989.
- Cross, Ian et al. Skills for lawyers, Jordan Publishing Company., 1997 Bristol.
- Jones Daniel, English Pronouncing Dictionary.

Reference Books

- Wallace, Michael J: Study Skills in English, Cambridge University Press, Cambridge,1980.
- Kelkar, Ashok R. "Communication and Style in Legal Language", Indian Bar Review
Vol. 10 (3): 1993.
- English Vocabulary in Use. Michael McCarthy & Felicity O'Dell ISBN: 9780521684569

Course Content

Topics
Basics of Pronunciation: Organs of Speech, Articulation System, Three Term Label, Consonant Sounds, Vowel Sounds; Introduction (Self and Lab Partners); Extempore; Presentation Techniques; Book Review, Newspaper Reading, Mock Lecture

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	Able to write simple and meaningful sentences with proper punctuation, to understand words, in isolation and in context, to understand instructions, requests and class lectures	1,2,5,10,11,12

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
EN G 181	Communicative English-I (P)	
	2	
	1	
	1	
	2	
	2	
	1	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 201	Blood Bank Procedures & Hemoglobinopathies-I	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basics of blood, blood groups and transfusion reactions

Course Outcomes

On completion of this course, the students will be able to understand Human Blood Group system, Blood grouping techniques, Principle & Practice of blood Transfusion, Blood Donation and blood collection techniques.

Catalog Description

This subject involves study of Principal of Blood grouping, antigen-antibody reaction, Agglutination, Haemagglutination, Condition required for antigen antibody reaction, Blood Transfusion service at District level, Guide lines for the use of Blood, Appropriate use of Blood, Health checks before donating blood, and Techniques of collecting blood from a donor.

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Content

Module 1

Introduction- Human Blood Group systems, ABO Blood group system, Antigen & Antibodies on RBC, Rh System, Rh Antigens & Rh Antibodies Hemolytic Disease of Newborn

Module 2

Methods for ABO grouping. Slide & Tube Method, Cell grouping, Serum, grouping, Rh grouping by slide & tube method, Difficulties in ABO grouping, Blood grouping techniques, Cell grouping, Serum grouping, Medical applications of Blood groups.

Module 3

Blood Donation- Introduction, Blood donor requirements, Criteria for selection & rejection, Health checks before donating blood.

Module 4

Blood Collection- Blood collection packs, Different types of Anticoagulants used in Blood bank, Techniques of collecting blood from a donor, Instructions given to the donor after blood donation.

Module 5

Compatibility tests, Detection of incomplete antigen by coombs test: Direct & Indirect, Monoclonal Antibodies

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	To understand Human Blood Group system, Blood grouping techniques, Principle & Practice of blood Transfusion, Blood Donation and blood collection techniques.	1,5,6,11											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 201	BloodBank Procedures & Hemoglobinopathies-I	2				1	2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 202	Endocrinology, Tumor & Cancer Markers-I	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of endocrinology and cancer and tumor markers.

Course Outcomes

On completion of this course, the students will be able to understand Regulation and general mechanism of action of hormones, Hormones of the Thyroid gland, Characteristics of growing tumor cells-general and morphological changes, biochemical changes.

Catalog Description

This subject involves study of Hormones of the Anterior Pituitary- Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Leuteinizing Hormone, Thyroid stimulating hormone, Thyroid disorders-goiter, myxedema, autoimmune thyroiditis, Clinical applications of tumor markers, Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA).

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Content

Module 1

ENDOCRINOLOGY

Introduction

Difference between hormones and enzymes.

Classification of hormones.

Module 2

Regulation and general mechanism of action of hormones.

Pituitary gland & hypothalamus

Hormones of the Anterior Pituitary- Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Leuteinizing Hormone, Thyroid stimulating hormone (TSH), Adrenocorticotrophic hormone (ACTH)

Hormones of neurohypophysis- Oxytocin, Antidiuretic hormone (ADH)

Module 3

Hormones of the Thyroid gland- chemistry and normal physiology, Thyroid disorders-goiter, myxedema, autoimmune thyroiditis, tumors of the thyroid gland, hyperthyroidism, Graves disease, Calcitonin, Parathyroid Hormone (PTH)

Module 4

TUMOR & CANCER MARKERS:

Introduction.

The Carcinogens-definition.

Oncogene-definition-

Mechanism of action of Oncogenes (outline).

Module 5

Characteristics of growing tumor cells-general and morphological changes, biochemical changes.

Tumor Markers-

Introduction and definition

Clinical applications of tumor markers.

Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK),

Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA).

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To understand Regulation and general mechanism of action of hormones, Hormones of the Thyroid gland, Characteristics of growing tumor cells-general and morphological changes, biochemical changes.												1,5,6,11
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 202	Endocrinology, Tumor & Cancer Markers-I	2				1	2					2	

1=Addressed to small extent
 2=Addressed significantly
 3=Major part of course

MLT 203	Clinical Biochemistry-I	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of Photometry, Water & Mineral Metabolism, Liver Functions & their Assessment, Measurements of serum enzyme levels, Bile pigment metabolism.

Course Outcomes

On completion of this course, the students will be able to understand absorbance, transmittance, absorption maxima, instruments, Distribution of fluids in the body, ELISA.

Catalog Description

This subject involves study of types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements, Carbohydrate metabolism, Protein metabolism, Lipid metabolism, Renal Function Tests- Various Tests, GFR & Clearance, Electrophoresis - Principle, Types & Applications.

Text Books

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

Reference Books

1. DS Sheriff, *Textbook of Medical Biochemistry*
2. U.Satyanarayan, *Textbook of Medical Biochemistry*

Course Content

Module 1

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

Module 2

Water & Mineral Metabolism-

Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements.

Module 3

Liver Functions & their Assessment-

Based on: Carbohydrate metabolism , Protein metabolism, Lipid metabolism

Module 4

Measurements of serum enzyme levels - Bile pigment metabolism, Jaundice, its types and their biochemical findings.

Renal Function Tests- Various Tests, GFR & Clearance

Module 5

Immunodiffusion Techniques, Radioimmunoassay & ELISA Principles & Applications.

Electrophoresis -

Principle, Types & Applications.

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand absorbance, transmittance, absorption maxima, instruments, Distribution of fluids in the body, ELISA.	1,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
MLT 203	Clinical Biochemist IV- I	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 204	Parasitology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deal with Classification of Parasites, Protozoa, Nematodes, and Phylum Platyhelminths.

Course Outcomes

To understand the Definition - parasitism, host, vectors, Life cycle, Morphology, Disease & Lab Diagnosis of protozoa, Nematodes, and Phylum Platyhelminths.

Catalog Description

This subject involves study of Phylum Protozoa- general Pathogenic and non pathogenic protozoa, Phylum Nematodes/Round worms (Nematoda), Phylum Platyhelminths - class-Cestoda, class-Trematode, Lab diagnosis of parasitic infections.

Text Books

1. Arora, *Medical Lab Technology*
2. Karykatee and Damle, *Textbook of Parasitology*

Reference Books

1. Anand Narayan and Panikar, *Textbook of Microbiology*
2. Baweja, *Medical Microbiology*

Course Content

Module 1

- Introduction to parasitology, types of Parasites, types of Hosts, Host Parasite relationship, Sources of infection, Portal of entry, Pathogenicity, Laboratory Diagnosis of parasitic infections

Module 2

- Introduction to protozoa Amoeboae: Entamoeba Histolytica, Entamoeba Coli,
- **Flagellates:** Giardia Lamblia, Trichomonas Vaginalis, Leishmania Donivani, Trypanosomes

Module 3

- **Sporozoa:** Plasmodium (Life cycl; Human Cucle, Mosquito Cycle,) Pathogenesis & Clinical Features, Pernicious malaria, Blac water fever, Other modes of Infection, Laboratory Diagnosis, treatment, prophylaxis

Module 4

- **Introduction to Helminths**
- **Cestodes:** Taenia Saginata, Taenia Solium, Echinococcus grnaulosus
- **Trematodes:** Fasciola Hepatica, Faciolopsis Buski, Paragonimus Westermani

Module 5

- **Nematodes:** Ascaris Lumbricoides, Hook Worms, Wuchereria Bancrofti
- **Diagnostic Methods:** Examination of Blood, Feces.
- Oppurtunistic Parasitic infections in AIDS

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To understand the Definition - parasitism, host, vectors, Life cycle, Morphology, Disease & Lab Diagnosis of protozoa, Nematodes, and Phylum Platyhelminths.												1,5
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 204	Parasitology	2				1							

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 251	Blood Bank Procedures & Hemoglobinopathies-I (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basics of blood, blood groups and transfusion reactions

Course Outcomes

On completion of this course, the students will be able to understand Human Blood Group system, Blood grouping techniques, Principle & Practice of blood Transfusion, Blood Donation and blood collection techniques.

Catalog Description

This subject involves study of Principal of Blood grouping, antigen-antibody reaction, Agglutination, Haemagglutination, Condition required for antigen antibody reaction, Blood Transfusion service at District level, Guide lines for the use of Blood, Appropriate use of Blood, Health checks before donating blood, and Techniques of collecting blood from a donor.

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Content

PRACTICAL

- Blood grouping by cell grouping technique
- Blood grouping by Serum grouping technique
- Blood grouping by slide technique
- Blood grouping by tube technique
- Cross matching
- Coombs direct test
- Coombs Indirect test
- Preparation of 0.9% NaCl
- Preparation of 5% cell suspension
- Blood donor selection
- Blood collection from Donor

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	To understand Human Blood Group system, Blood grouping techniques, Principle & Practice of blood Transfusion, Blood Donation and blood collection techniques.	1,5,6,11											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 251	Blood Bank Procedures & Hemoglobinopathies- I (P)	2				1	2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 252	Endocrinology, Tumor & Cancer Markers-I (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of endocrinology and cancer and tumor markers.

Course Outcomes

On completion of this course, the students will be able to understand Regulation and general mechanism of action of hormones, Hormones of the Thyroid gland, Characteristics of growing tumor cells-general and morphological changes, biochemical changes.

Catalog Description

This subject involves study of Hormones of the Anterior Pituitary- Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Leuteinizing Hormone, Thyroid stimulating hormone, Thyroid disorders-goiter, myxedema, autoimmune thyroiditis, Clinical applications of tumor markers, Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA)

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Content

PRACTICALS

ENDOCRINOLOGY

1. Estimation of T3
2. Estimation of T4
3. Estimation of TSH
4. Estimation of FSH
5. Estimation of LH

TUMOR & CANCER MARKERS:

1. Estimation of Alpha feto proteins (AFP)

2. Estimation of Carcino embryonic antigen (CEA)

OTHER ELISA TESTS

1. Test for HIV
2. Test for Hepatitis B (HBsAg)
3. Test for Hepatitis (HCV)

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand Regulation and general mechanism of action of hormones, Hormones of the Thyroid gland, Characteristics of growing tumor cells-general and morphological changes, biochemical changes.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
ML T 252	Endocrinology, Tumor & Cancer Markers- I (P)	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 253	Clinical Biochemistry-I (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of Photometry, Water & Mineral Metabolism, Liver Functions & their Assessment, Measurements of serum enzyme levels, Bile pigment metabolism.

Course Outcomes

On completion of this course, the students will be able to understand absorbance, transmittance, absorption maxima, instruments, Distribution of fluids in the body, ELISA.

Catalog Description

This subject involves study of types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements, Carbohydrate metabolism, Protein metabolism, Lipid metabolism, Renal Function Tests- Various Tests, GFR & Clearance, Electrophoresis - Principle, Types & Applications.

Text Books

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

Reference Books

1. DS Sheriff, *Textbook of Medical Biochemistry*
2. U.Satyanarayan, *Textbook of Medical Biochemistry*
3. Chawla, *Practical Clinical Biochemistry Methods and Interpretation.*

Course Content

PRACTICAL

(By Colorimeter / Spectrophotometer)

Blood urea estimation

Serum creatinine estimation

Serum uric acid estimation

Serum total protein estimation

Serum albumin estimation

Serum globulin estimation

Serum glucose estimation

Total cholesterol estimation

HDL cholesterol (direct) estimation

LDL cholesterol (direct) estimation

Triglyceride estimation

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total M arks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To understand absorbance, transmittance, absorption maxima, instruments, Distribution of fluids in the body, ELISA.												1,6,11
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 253	Clinical Biochemistry-I (P)	2					2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

ENG 231	Communicative English -II	L	T	P	C
Version1.01	Date of Approval: Jun 15, 2013	2	0	0	2
Pre-requisites	Communicative English -I				

Course Description

Though, we take students of undergraduate courses to be proficient in English language, we have been proved wrong time and again. The course presented here, is a skill based programme, where we would try to improve all the four skills of the students i.e. LSRW (Listening, Speaking, Reading and Writing). The quest is to improve their understanding and expression so that they are able to do much better in their studies and life as a resultant.

Course Objectives

- 1 To help the students understand and communicate in English as used in day to day activities.
2. To help the students enhance their competence in the English language.

Course Pre-requisite Basic understanding of English language/ Diagnostic Test

Course Outcomes

The students will get the required training in LSRW through the prescribed texts and would be:

1. Able to write simple and meaningful sentences with proper punctuation.
2. Able to understand words, in isolation and in context
3. Able to understand instructions, requests and class lectures.
4. Able to pronounce words correctly in everyday use

Prescribed Texts

1. Murphy Raymond, Essential English Grammar, Cambridge Uni. Press.
2. Intermediate English Grammar. Raymond Murphy ISBN NO 978-81-7596-676-5
3. Essential English Grammar. Raymond Murphy ISBN: 9788175960299
4. Wallace, Michael J: Study Skills in English, Cambridge University Press, Cambridge, 1980.

Additional References

1. Bhatnagar, R.P. & R. Bhargava, Law and language, New Delhi: Macmillan.
2. Cross, Ian et al. Skills for lawyers, Jordan Publishing Company., 1997 Bristol.
3. Madabhushi Sridhar, Legal Language, Asia Law House, Hyderabad.
4. Legal Language and Legal Writing – P.K. Mishra

Pedagogy

The course will aim at the facilitation of acquisition of the four basic language skills (listening, speaking, reading and writing) in English language among the heterogeneous set of student base through their active participation in various language skills development related activities.

Components	Theory		Laboratory		Theory and laboratory
	Internal	SEE	Internal	SEE	
Marks	20	80	20	80	
Total Marks	100		100		
Scaled Marks	80		20		100

Evaluation Scheme

Description	Weight age (Percentage)
• Assignment & Quiz (1,2 &3)	20%
• CAT 1 *	15%
• CAT 2	15%
• End Term Exam (3 hours)	50%

*continuous Assessment Test

Detailed Outlines of the Course

SESSION WISE INSTRUCTION PLAN

Course Name			L	T	P	C
			2	0	0	2
Session No	Module	Topics	Core Reading		Additional Reference	
	I	The Art of Condensation; Reading Comprehension; Introduction to Adjectives; Adverbs, Reported Speech; Word Formation				
	II	Constituents of Effective Writing; Modals; Letter Writing (Sales Letter, Cover letter); Resume Writing; Vocabulary (Antonyms, Synonyms, One Word Substitution)				
	III	Presentation Techniques; Fundamentals of Report Writing; Essay Writing, E-mail and Telephonic Etiquettes				



GALGOTIAS UNIVERSITY

Greater Noida, Uttar Pradesh

Name:

Enrolment No:

Batch No:

Model Question Paper

Semester End Examination(SEE) – June, 2013

Course : Communicative English II ENG 104

Department: English

Programme: B. Tech,BCA, B.Sc(F.Sc),BHM,B.A.(H)Eco,B.Com, BBL,BAL,

Semester: Winter

Time: 3 hrs

Max. Marks:100

PART – A (10 X 2 = 20 Marks)

Answer ALL the Questions

1.	Choose the correct word to fill in the blanks I. He is suffering from an unknown a. decease b. disease II. Very strong was blowing from the east. a.air b.wind	[2]
2.	The range of interpersonal distance of the public zone is: a. 0 inch to 18 inches b. 18 inches to 3 feet c. 4 feet to 6 feet d. more than 12 feet	[2]
3.	Give one word substitutes for the following: i. One who knows everything ii. One dies for his people or country	[2]
4.	Mention any two additional elements of a business letter.	[2]

5.	Give synonyms for the following: i. anger ii. affluent	[2]
6.	Use the following phrasal verbs in your sentences: i. look into ii. put off	[2]
7.	What is the meaning of 'couch' in the line "For oft when on my couch I lie, in vacant or in pensive mood"?	[2]
8.	Write any four challenges that a presenter faces while giving a PowerPoint Presentation.	[2]
9.	List any two kinds of cases with reference to the topic 'case study'.	[2]
10.	Write the definition of a leader.	[2]
PART – B (5 X 8 = 40 Marks)		
Answer <u>ALL</u> the Questions		
11.	Correct the following sentences: i. I am reading a book since morning. ii. They have completed their homework this morning. iii. I reached home before my father came. iv. My friend told me that he will gift me my favourite book on my birthday. v. I am understanding your problem. vi. She did not liked rice . vii. Where you are going this evening? viii. you hurted my feelings.	[8]
12.	Mark the part/s with errors in the following sentences: i. My cat was/ hungry as she had /not eaten/ from morning. ii. I am more happier/ than my friends/ who are/ playing football. iii. After she completed/ her work she /locked her office/ and went home. iv. Rahul is brighter/ than any boy/ in my class. v. He said something/ but I could/ not listen at it. vi. In spite of been/ quite prosperous/ he is unhappy. vii. Gitika was/ a most intelligent/ girl in the class. viii. The train left /before I reached/ the station.	[8]
13.	Change the following as indicated: i. How can you say this? (Passive) ii. He is known to everyone. (Active) iii. Delhi is one of the biggest cities in India. (Positive degree)	[8]

	<p>iv. No other building in India is as beautiful as the Taj. (Comparative degree)</p> <p>v. On hearing a noise, he woke up. (Complex sentence)</p> <p>vi. Who does not know Mahatma Gandhi? (Affirmative)</p> <p>vii. He is too weak to walk. (Complex sentence)</p> <p>viii. My friend congratulated me on my getting selected in IAS. (Passive)</p>	
14.	<p>Frame the following sentences by choosing the correct options :He is junior (than/to) me.</p> <p>i. The Taj is one of the most beautiful (buildings/building) in the world.</p> <p>ii. Do you have (any/some) friends in this city?</p> <p>iii. Mr. Smith is (a/an) European.</p> <p>iv. Delhi is (the/a/ No article) London of India.</p> <p>v. You (should/should have) gone there yesterday.</p> <p>vi. I (am/have been/has been) waiting for you since morning.</p> <p>vii. Rahul is one of the tallest (boys/boy) in the class.</p>	[8]
15.	<p>Correct the following sentences:</p> <p>i. Mohit purchased many costly furnitures for his new house.</p> <p>ii. My friend helps the poors whenever he meets them.</p> <p>iii. One should do his duty.</p> <p>iv. I told everyone to bring their coats since the temperature is falling.</p> <p>v. We reached at the airport at 9 pm.</p> <p>vi. If you speak slow, children will understand you better.</p> <p>vii. Sumit is more wiser than his brother.</p> <p>viii. Rahul works very fastly.</p>	[8]
	<p>PART – C (2 X 20 = 40 Marks)</p> <p>Answer <u>ANY</u> two Questions</p>	
16.	<p>(a)</p> <p>i. Draft an advertisement of an imaginary car BSR Land Glider (SUV) in less than 40 words. This advertisement is intended for hoardings. Invent the details.</p> <p>ii. Why was Phatik’s decision to go to Calcutta not right?</p> <p>(b) Assuming yourself the Librarian of your university, draft a letter to Oxford Publications, Jai Singh Road, New Delhi 110001, enquiring about the availability and price of some books required for your library. Invent the details regarding titles, authors, etc.</p>	<p>[5]</p> <p>[5]</p> <p>[10]</p>

17.	<p>(a) Read the following extracts carefully and answer the questions that follow.</p> <p>(i) Certainly, in taking revenge, a man is but even with his enemy; but in passing it over, he is superior; for it is a prince's part to pardon. And Solomon, I am sure, saith, It is the glory of a man, to pass by an offence. That which is past is gone, and irrevocable; and wise men have enough to do, with things present and to come; therefore they do but trifle with themselves, that labor in past matters.</p> <p>A. Name the author of these lines. B. What is the meaning of the word "Irrevocable" in this passage? C. What did Solomon say? D. Why is forgiving better than taking revenge?</p> <p>(ii) You are all knowing, friends, What sweetness is in Miss Pushpa. I don't mean only external sweetness but internal sweetness. Miss Pushpa is smiling and smiling even for no reason but simply because she is feeling.</p> <p>A. Name the poem and the poet. B. What are the good qualities of Ms Pushpa? C. How does the poet make fun of common errors in Indian English?</p> <p>(b) Write a report on the Republic Day celebration in your university for the university news letter. Invent the details.</p>	<p>[1] [1] [1] [1] [1] [2] [2] [10]</p>
18.	<p>(a) Prepare a classified advertisement for a job vacancy for the post of Assistant Sales Managers in Usha Fans Pvt. Ltd.</p> <p>(b) What are the challenges that a presenter faces while making presentation? How can he/she overcome these challenges?</p>	<p>[10] [10]</p>

ENG 281	Communicative English -II PRACTICAL	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Description:

Though, we take students of undergraduate courses to be proficient in English language, we have been proved wrong time and again. The course presented here, is a skill based programme, where we would try to improve all the four skills of the students i.e. LSRW (Listening, Speaking, Reading and Writing). The quest is to improve their understanding and expression so that they are able to do much better in their studies and life as a resultant.

Course Objectives:

1. To help the students understand and communicate in English as used in day to day activities.
2. To help the students enhance their competence in the English language.
- 3.

Course Pre-requisite: Basic understanding of English language/ Diagnostic Test

Course Outcomes:

The students will get the required training in LSRW through the prescribed texts and would be:

1. Able to write simple and meaningful sentences with proper punctuation.
2. Able to understand words, in isolation and in context
3. Able to understand instructions, requests and class lectures.
4. Able to pronounce words correctly in everyday use

Prescribed Texts:

1. Cambridge Grammar for IELTS with answers. ISBN NO 9780521706117
2. Byne: Teaching Writing Skills, Longman, London 1989.
3. Cross, Ian et al. Skills for lawyers, Jordan Publishing Company., 1997 Bristol.
4. Jones Daniel, English Pronouncing Dictionary.

Additional References:

1. Wallace, Michael J: Study Skills in English, Cambridge University Press, Cambridge, 1980.
2. Kelkar, Ashok R. "Communication and Style in Legal Language", Indian Bar Review Vol. 10 (3): 1993.
3. English Vocabulary in Use. Michael McCarthy & Felicity O'Dell ISBN: 9780521684569

Pedagogy The course will aim at the facilitation of acquisition of the four basic language skills (listening, speaking, reading and writing) in English language among the heterogeneous set of student base through their active participation in various language skills development related activities.

Evaluation Scheme

	Laboratory		Laboratory
Components	Internal	SEE	
Marks	50	50	
Total Marks	100		
Scaled Marks	25		25

*Continuous Assessment Test

Detailed Outlines of the Course

SESSION WISE INSTRUCTION PLAN

Course Name			L	T	P	C
			0	0	2	1
Session No	Module	Topics	Core Reading		Additional Reference	
		Basics of Pronunciation: Phonemes, Allophones, Syllables, Stress, Accent, Intonation, Phonetic Transcription; Group Discussion, Do's and Don'ts of GD; Debate; Role Play; Live Presentations ; Movie Review; Book Review, Newspaper Reading; Mock Lecture; Mock Interview; Skit ; Picture Interpretations; Powerpoint Presentations				

MLT 205	Blood Bank Procedures & Hemoglobinopathies-II	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites/Exposure					
Co-requisites					

Course Objectives

To understand the basic procedures in blood transfusion, maintenance of Blood Bank Records, Blood Components.

Course Outcomes

On completion of this course, the students will be able to understand Screening donor's blood for infectious agents - HIV, HCV, HBV, Blood donation record book, Recording results, Blood donor card, Compatibility Testing, Collection of blood components for fractional transfusion, Platelets packed Red Cell, Platelet rich Plasma, Platelets concentrate.

Catalog Description

This subject involves study of Trepanoma palladium, Plasmodium, HTLV, Bacterially contaminated Blood, Storage & Transport- Storage of blood, Changes in blood after storage, Gas refrigerator, Lay out of a blood bank refrigerator, Transportation, Blood bank stock sheet, Blood transfusion request form, Labeling & Issuing cross- matched blood.

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Contents

Module 1

Introduction: Principles of clinical Transfusion, Safe blood. **Screening of blood donations:** Steps in blood screening, blood safety in hospital setting, blood donor recruitment, blood collection.

Module 2

Blood components: Whole blood, packed red cells, platelet concentrates, fresh frozen plasma, cryoprecipitated anit hemophilic factor. & **storage of blood components**

Module 3

Clinical Transfusion procedure: Indications of blood transfusion, transfusion trigger, responsibility of attending physician. **Adverse effects of transfusion:** Guidelines for recognition and management of acute transfusion reactions, Investigating acute transfusion reactions, Haemolytic transfusion reaction, Bacterial contamination and septic shock.

Module 4

Transfusion associated circulatory overload, Anaphylactic reaction, Transfusion related acute lung injury, Transfusion related acute lung injury, Delayed complications of transfusion (Delayed haemolytic transfusion reaction, Post-transfusion purpura, Transfusion associated graft-versus-host disease, Delayed complications: transfusion transmitted infections)

Module 5

Massive blood transfusion: Transfusion in Paediatrics: Top-up transfusions, Exchange transfusion, Haemolytic disease of the newborn, ABO haemolytic disease of the newborn, Transfusion of platelets and FFP in paediatric patients.

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand Screening donor's blood for infectious agents - HIV, HCV, HBV, Blood donation record book, Recording results, Blood donor card, Compatibility Testing, Collection of blood components for fractional transfusion, Platelets packed Red Cell, Platelet rich Plasma, Platelets concentrate	1,6

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 205	BloodBank Procedures & Hemoglobinopathies- II	2					2						

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 206	Endocrinology, Tumor & Cancer Markers-II	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of endocrinology and cancer and tumor markers.

Course Outcomes

On completion of this course, the students will be able to understand Adrenocortical hormones-synthesis and secretion, Aldosterone & its function, Addisons disease, Glucocorticoids & functions, Hormones of the gonads, Carbohydrate markers and Bladder cancer markers.

Catalog Description

This subject involves study of Cortisol & functions, Cushing's syndrome, Conn's syndrome, Human Chorionic Gonadotropin (HCG), hormone, menstrual cycle, Menopause, Hormone of pancreas, Oncofetal antigens, Alpha fetoprotein (AFP), Carcino embryonic antigen (CEA), Squamous cell carcinoma (SCC) antigen, Blood group antigen (brief introduction of each type) CA 19-9, CA 50, CA 72-4, CA 242, Biomarkers still in research (introduction in brief)- Telomeres, TRAP assay, hyaluronic acid and Hyaluronidase.

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Content

Module 1

Adrenocortical hormones-synthesis and secretion, Aldosterone & its function, Addisons disease, Glucocorticoids & functions, Mineralocorticoids & functions, Cortisol & functions, Cushing's syndrome, Conn's syndrome.
Adrenal medulla-metabolism of catecholamines

Module 2

Hormones of the gonads -

Testosterone, Estrogens, Progesterone, their synthesis and functions.

Human Chorionic Gonadotropin (HCG), hormone, menstrual cycle, Menopause

Hormone of pancreas - Insulin- its metabolic effects on carbohydrates, fats & protein, control of insulin secretion, Glucagon- functions, metabolic effects, blood glucose regulation, Diabetes Mellitus, Somatostatin, Hormone of kidney - Renin

Module 3

Hormones as tumor markers (introduction of each type in brief), Oncofetal antigens, Alpha fetoprotein (AFP), Carcino embryonic antigen (CEA), Squamous cell carcinoma (SCC) antigen.

Module 4

Carbohydrate markers (brief introduction of each type)- CA 15-3, CA 125

Blood group antigen (brief introduction of each type)

CA 19-9, CA 50, CA 72-4, CA 242

Module 5

Bladder cancer markers (introduction in brief) -

Bladder tumor antigen (BTA)

Fibrin- Fibrinogen degradation product (FDP).

Nuclear matrix protein (NMP22).

Biomarkers still in research (introduction in brief)-

Telomeres, TRAP assay, hyaluronic acid and Hyaluronidase

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand Adrenocortical hormones-synthesis and secretion, Aldosterone & its function, Addisons disease, Glucocorticoids & functions, Hormones of the gonads, Carbohydrate markers and Bladder cancer markers.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
MLT 206	2	Endocrinology, Tumor & Cancer Markers-II

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 207	Clinical Biochemistry-II	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of Polymerase Chain Reaction, Vitamin, Glucose Estimation.

Course Outcomes

On completion of this course, the students will be able to understand Autoanalysers - Principle & Applications, Fat & water soluble vitamins, Cardiac Profile parameters.

Catalog Description

This subject involves study of Polymerase Chain Reaction, Autoanalysers - Principle & Applications, Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart disease, Different methods of Cholesterol Estimation, Different methods of Glucose Estimation.

Text Books

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

Reference Books

1. DS Sheriff, *Textbook of Medical Biochemistry*
2. U.Satyanarayan, *Textbook of Medical Biochemistry*

Course Content

Module1

Polymerase Chain Reaction -
Principle & Applications

Module2

Autoanalysers -
Principle & Applications
Vitamins-Introduction & Classification

Module3

Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.

Module4

Cardiac Profile -

In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases

Module5

Different methods of Glucose Estimation-

Principle advantage and disadvantage of different methods

Different methods of Cholesterol Estimation-

Principle, advantage and disadvantage of different methods.

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand Autoanalysers - Principle & Applications, Fat & water soluble vitamins, Cardiac Profile parameters	1,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
MLT 207	2	Clinical Biochemistry- II

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 255	Clinical Biochemistry-II (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with practicals of Clinical Biochemistry.

Course Outcomes

On completion of this course, the students will be able to understand Serum Bilirubin total estimation, Serum Bilirubin direct estimation, Serum amylase estimation, Serum GOT (AST) estimation, Serum GPT (ALT) estimation, Alkaline phosphatase estimation, Acid phosphatase estimation, Serum sodium estimation, Serum potassium estimation by colorimetry/spectrophotometer,

Catalog Description

This subject involves study of understand Serum Bilirubin total estimation, Serum Bilirubin direct estimation, Serum amylase estimation, Serum GOT (AST) estimation, Serum GPT (ALT) estimation, Alkaline phosphatase estimation, Acid phosphatase estimation, Serum sodium estimation, Serum potassium estimation by colorimetry/spectrophotometer,

Text Books

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

Reference Books

1. DS Sheriff, *Textbook of Medical Biochemistry*
2. U.Satyannarayan, *Textbook of Medical Biochemistry*

Course Content

PRACTICAL

(By Colorimeter / Spectrophotometer)

- Serum Bilirubin total estimation
- Serum Bilirubin direct estimation
- Serum amylase estimation
- Serum GOT (AST) estimation
- Serum GPT (ALT) estimation
- Alkaline phosphatase estimation
- Acid phosphatase estimation
- Serum sodium estimation
- Serum potassium estimation
- Serum chloride estimation
- CK-NAC estimation

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To understand Serum Bilirubin total estimation, Serum Bilirubin direct estimation, Serum amylase estimation, Serum GOT (AST) estimation, Serum GPT (ALT) estimation, Alkaline phosphatase estimation, Acid phosphatase estimation, Serum sodium estimation, Serum potassium estimation by colorimetry/spectrophotometer.												1,6,11
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 255	Clinical Biochemistry-II(P)	2					2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 254	Endocrinology, Tumor & Cancer Markers-II (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the concept of endocrinology and cancer and tumor markers.

Course Outcomes

On completion of this course, the students will be able to understand estimation of hCG
 Estimation of Cortisol, Estimation of Progesterone, Estimation of Testosterone, Estimation of
 CA- 125, Estimation of Prostate specific antigen (PSA), Test for Hepatitis (HCV)
 Malaria antigen, Tuberculosis-IgG/IgM.

Catalog Description

This subject involves study of estimation of hCG, Estimation of Cortisol, Estimation of
 Progesterone, Estimation of Testosterone, Estimation of CA- 125, Estimation of Prostate specific
 antigen (PSA), Test for Hepatitis (HCV), Malaria antigen, Tuberculosis-IgG/IgM.

Text Books

1. Kanai Mukherjee, Medical Laboratory Technology
2. Mehendi, Laboratory Procedure in Haematology.

Reference Books

1. Praful Godkar, Textbook of Medical Laboratory Technology
2. Dasie Lewis, Medical Laboratory Technology

Course Content

PRACTICALS

ENDOCRINOLOGY

Estimation of hCG
 Estimation of Cortisol
 Estimation of Progesterone
 Estimation of Testosterone

TUMOR & CANCER MARKERS:

Estimation of CA- 125

Estimation of Prostate specific antigen (PSA)

OTHER ELISA TESTS

Test for Hepatitis (HCV)

Malaria antigen

Tuberculosis-IgG/IgM

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand estimation of hCG, Estimation of Cortisol, Estimation of Progesterone, Estimation of Testosterone, Estimation of CA- 125, Estimation of Prostate specific antigen (PSA), Test for Hepatitis (HCV), Malaria antigen, Tuberculosis-IgG/IgM.	1,5,6,11

	1	Medical Lab Technology Knowledge
	2	Thinking Abilities
	3	Planning abilities
	4	Leadership skills
	5	Professional Identity
	6	Medical Lab Technology and society
	7	Environment and sustainability
	8	Ethics
	9	Individual or team work
	10	Communication
	11	Modern & Usage
	12	Life-long Learning
ML T 254	2	Endocrinology, Tumor & Cancer Markers- II (P)

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 208	Virology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with the virology.

Course Outcomes

On completion of this course, the students will be able to understand General properties of virus, cultivation of viruses.

Catalog Description

This subject involves study of Hepatitis viruses, Adenoviruses, Picornaviruses, Orthomyxovirus, SARS, Rotavirus, Norwalk virus, Astrovirus, Corona virus.

Text Books

1. Arora, Medical Lab Technology
2. Karykatee and Damle, Textbook of Parasitology

Reference Books

1. Anand Narayan and Panikar, Textbook of Microbiology
2. Baweja, Medical Microbiology

Course Content

Module I

Introduction of virology, Evolutionary origin of viruses, Morphology & Classification, Reaction to physical & chemical agents, viral multiplication, Transcription, Translation. Prions, cultivation; (Egg inoculation, Chick Embryo, Tissue Culture)

Module 2 m

Bacteriophage, Pathogenesis, clinical features of DNA Virus; Pox virus, Herpes virus. Adeno viruses

Module 3

Pathogenesis, clinical features of DNA Virus RNA Virus; Influenza virus, paramyxovirus, rubella virus, Rhabdovirus, Arbovirus

Module 4

Oncogenic viruses, Mechanism of viral oncogenesis, Miscellaneous viruses; (Hepatitis virus, Rota virus, Parvovirus) Bacteriophage.

Module 5

Chemotherapy viral diseases; Inhibitors, of DNA Polymerase, Reverse transcriptase, Nucleoside analogues

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand General properties of virus, cultivation of viruses.	1,6,11

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 208	Virology	2					2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 301	Mycology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with the mycology.

Course Outcomes

On completion of this course, the students will be able to understand Introduction of Mycology. Terms & Classification, Lab Diagnosis of Fungal Infections.

Catalog Description

This subject involves study of Superficial Mycoses, Subcutaneous Mycoses, Mycetoma, Sporotrichosis, Dermatophytes, Systemic Mycoses, Penicillosis, Zygomycosis, Pneumocystis Mycotoxins.

Text Books

1. Arora, *Medical Lab Technology*
2. Karykatee and Damle, *Textbook of Parasitology*

Reference Books

1. Anand Narayan and Panikar, *Textbook of Microbiology*
2. Baweja, *Medical Microbiology*

Course Content

Module 1

Introduction of Mycology, importance of fungal infections, structure of fungus, classification of fungus, fungal infection classification

Module 2

Superficial infections: Surface-Tinea versicolor, nigra, Piedra. Cutaneous Infection-Dermatophytoses, Trichophyton, Trichophyton, laboratory diagnosis.

Module 3

Deep mycosis: Sporotrichosis, Rhinosporeidosis, Blastomycosis, coccidiomycosis

Module 4

Opportunistic mycosis: Aspergillosis, Mucormycosis, Micotic poisoning

Module 5

Laboratory Diagnosis of fungal infections, Sample collection, Skin Scrapings, Skin strippings, Nail, Hair, Transport of samples

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To understand Introduction of Mycology. Terms & Classification, Lab Diagnosis of Fungal Infections.												1,6,11
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 301	Mycology	2					2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 302	Systemic Bacteriology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To get familiar with Systemic Bacteriology.

Course Outcomes

The students will learn Systematics study and scientific study of organisms, with the ultimate objective of characterizing and arranging them in an orderly manner. Methods and approaches used to characterize, classify, and identify bacteria are examined, and some commonly encountered groups of bacteria are considered as examples.

Catalog Description

The course Systemic Bacteriology deals with Classification, nomenclature, and identification of bacteria. Methods and approaches for the isolation and identification of bacteria are considered in the laboratory. The characteristics of some groups of common bacteria and the contributions of molecular systematics to bacterial classification are discussed.

Text Books

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 Ananthanerayan

Reference Books

1. Practical Medical Microbiology by Mackie and MacCartney
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol.I ,II, III by Mukherjee
5. District Laboratory Practice in tropical countries Vol II Microbiology by Monica
6. Cheesbrough
7. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

Course Content

Module I

Gram positive & Negative cocci: Staphylococci, Streptococci, Neisseria

Module II

Gram Positive & Negative Bacilli: Positive: Anthrax, Diphtheria, Clostridium species

Negative: Enterobacteriaceae, Vibrios, Brucella. Bordetella, Haemophilus, Pasteurella, Non sporing anaerobic bacteria

Module III

Mycobacterium species: TB, Leprosy, AFB stain

Module IV

Spirochaetes: Leptospira, Borrelia, Treponema

Module V

Bacterial infections & diagnosis: Wound infection, post operative infection, Urinary tract infection, Respiratory tract infection, Diarrhoeas & food poisoning, Infection of CNS, Nosocomial Infections

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To understand Systematic study and scientific study of organisms, with the ultimate objective of characterizing and arranging them in an orderly manner. Methods and approaches used to characterize, classify, and identify bacteria are examined, and some commonly encountered groups of bacteria are considered as examples.												1,5,6,11,12
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 302	Systemic Bacteriology	3				1	2					2	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 303	Histopathology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with the study of histopathology.

Course Outcomes

On completion of this course, the students will be made aware of terminology used in histopathology, Various instruments and their maintenance and also processing of various samples for histopathological investigations.

Catalog Description

This subject involves study of histotechnology, collection and transport of specimens for histological examination, concept of fixation, decalcification, processing of various tissues and embedding, section cutting, various types of staining, automated tissue processes, microtomes etc

Text Books

1. Praful Godkar, *Textbook of Medical Laboratory Technology*
2. Dasie Lewis, *Medical Laboratory Technology*
3. Kanai Mukherjee, *Medical Laboratory Technology*
4. Bancroft, *Textbook of Medical Laboratory Techniques*

Reference Books

1. Praful Godkar, *Textbook of Medical Laboratory Technology*
2. Dasie Lewis, *Medical Laboratory Technology*
3. Kanai Mukherjee, *Medical Laboratory Technology*
4. Bancroft, *Textbook of Medical Laboratory Techniques*

Course Content

Module I

Introduction to Histopathology

Reception of specimens, Types of histological preparations, Use of Microscopes-Light Microscope, Polarising Microscope, Phase contrast Microscope, Fluorescent Microscope

Module II

Fixation

Basic Concept of fixation and types of fixatives used in a routine histopathology laboratory

Module III

Decalcification

Criteria of a good decalcification agent

Techniques of decalcification followed with selection of tissue, fixation and decalcification, neutralization of acid and thorough washing

Various types of decalcifying fluids: Organic & Inorganic, Chelating agents, Use of Ion exchange resins and Electrolytic decalcification and treatment of hard tissue

Module IV

Tissue processing and embedding

Procedure followed by Dehydration, Clearing, Infiltration and routine timing schedule for manual or automatic tissue processing

Embedding – definition and various types

Module V

Section cutting, Staining, Impregnation and Mountants

Microtome Knives, Sharpening of Microtome Knives, Mode of preparation of H (Haematoxylin) & E (Eosin) staining, basic steps in staining and mounting paraffin sections,

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand terminology used in histopathology, Various instruments and their maintenance and also processing of various samples for histopathological investigations.	1,6,11

		1	2	3	4	5	6	7	8	9	10	11	12
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
MLT 303	Histopathology	2					2					2	

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT 351	Mycology(P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with the mycology.

Course Outcomes

On completion of this course, the students will be able to understand Introduction of Mycology. Terms & Classification, Lab Diagnosis of Fungal Infections.

Catalog Description

This subject involves study of Superficial Mycoses, Subcutaneous Mycoses, Mycetoma, Sporotrichosis, Dermatophytes, Systemic Mycoses, Penicillosis, Zygomycosis, Pneumocystis Mycotoxins.

Text Books

1. Arora, *Medical Lab Technology*
2. Karyakartee and Damle, *Textbook of Parasitology*

Reference Books

1. Anand Narayan and Panikar, *Textbook of Microbiology*
2. Baweja, *Medical Microbiology*

Course Content

Mycology:

1. Slide culture technique
2. KOH mount
3. Identification of fungal cultures
4. Colony characteristics and Microscopic examination of Candida, Cryptococcus, Trichophyton, Microsporum, Aspergillus niger, Asp fumigatus, Rhizopus, Fusarium, Penicillium.

Mode of Evaluation: The Lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	To understand Introduction of Mycology. Terms & Classification, Lab Diagnosis of Fungal Infections.	1,6,11											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 351	Mycology (P)	2					2					2	

- 1=Addressed to small extent
- 2=Addressed significantly
- 3=Major part of course

MLT 352	Systemic Bacteriology (Practical)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To familiar with practical aspects of systemic bacteriology.

Course Outcomes

Students will be exposed to different staining methods & Biochemical tests for the identification of microbes.

Catalog Description

The course Systemic Bacteriology deals with Classification, nomenclature, and identification of bacteria. Methods and approaches for the isolation and identification of bacteria are considered in the laboratory. The characteristics of some groups of common bacteria and the contributions of molecular systematics to bacterial classification are discussed.

Text Books

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 Ananthanerayan

Reference Books

1. Practical Medical Microbiology by Mackie and MacCartney
2. Text book of Microbiology by Ananthanerayan
3. Medical Microbiology by Paniker & Satish Gupte

Course Contents

1. Demonstration of Simple staining
2. Demonstration of Gram stain
3. Demonstration of Albert stain
4. Demonstration of Z-N staining
5. Demonstration of Capsule staining
6. Demonstration of Hanging drop technique
7. Demonstration of Biochemical tests
8. Demonstration of CAMP

Mode of Evaluation: The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70

Total Marks	100
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Relationship between the Course Outcomes (COs) and Program Outcomes (Pos)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)												Mapped Programme Outcomes
1	To study the nutritional requirements of microbes and will be exposed on different staining for identification of microbes, methods of sterilization, RW coefficient, sterility testing and anti microbial assays.												1,5,6,8,11,12
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 352	Systemic Bacteriology (Practical)	3				1	2		1			2	2

- 1=Addressed to small extent
- 2=Addressed significantly
- 3=Major part of course

MLT 353	Histopathology (P)	L	T	P	C
Version	Date of Approval:	0	0	2	1
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with the practical histopathology.

Course Outcomes

On completion of this course, the students will be able to understand Instrumentation: Automated Tissue Processor, Micro tomes, Knives, Knife sharpeners And Ultra microtome, Techniques, Mounting techniques.

Catalog Description

This subject involves study of histotechnology, collection and transport of specimens for histological examination, concept of fixation, decalcification, processing of various tissues and embedding, section cutting, various types of staining, automated tissue processes, microtomes etc

Text Books

1. Praful Godkar, *Textbook of Medical Laboratory Technology*
2. Dasie Lewis, *Medical Laboratory Technology*
3. Kanai Mukherjee, *Medical Laboratory Technology*
4. Bancroft, *Textbook of Medical Laboratory Techniques*

Reference Books

1. Praful Godkar, *Textbook of Medical Laboratory Technology*
2. Dasie Lewis, *Medical Laboratory Technology*
3. Kanai Mukherjee, *Medical Laboratory Technology*
4. Bancroft, *Textbook of Medical Laboratory Techniques*

Course contents:

1. Demonstration of instruments used for dissection
2. Reception and labeling of histological specimens
3. Preparation of Various types of Fixatives
4. Preparation of ascending and descending grades of alcohol from absolute alcohol
5. Demonstration of Sharpening of microtome knife (Honing and stropping technique)
6. Demonstration of section cutting by Microtome (rough and fine)
7. Demonstration of tissue floatation bath and drying of sections in oven (60-65 C)

8. Perform Staining by Hematoxylin & Eosin
9. Mounting of stained smears

Mode of Evaluation:

The lab performance of students is evaluated as:

	Lab	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand Instrumentation: Automated Tissue Processor, Micro tomes, Knives, Knife sharpeners And Ultra microtome, Techniques, Mounting techniques.	1,6,11

MLT 304	Medical Laboratory Technician-I	L	T	P	C
Version 1.0		8	0	0	8
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This program is aimed at training candidates for the job of a “Medical Laboratory Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

On completion of this course student will able 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.; 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.

Reference Books

1. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone
2. Anatomy for Nurses By Asha Latha
3. Essentials of Physiology by Sembulingam
4. Hand book of Health care quality & patient safety
5. Text book of Biochemistry by U. Satyanarayana
6. Text book of Medical Laboratory Technology by Godkar
7. Textbook of Microbiology By Presscott
8. Textbook of Parasitology by CP. Baveja
9. Textbook of Pathology by Harshamohan
10. Textbook of Immunology by S.K gupta
11. Textbook of Hematology & Clinical pathology by Ram das naik

COURSE CONTENT

Module I

- Healthcare Systems, Laboratory and Delivery: 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 at different level (National / State / District)
- 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.
- Introduction to Laboratory related Medical Terminology: Understand appropriate use of laboratory related medical terminology in daily activities with colleagues, patients and family.

Module 2

- Introduction to Biochemistry, Haematology and Clinical Pathology & Examination of Semen, CSF and Knowledge about Other Body Fluids Like Pleural Fluid, Pericardial Fluid, Peritoneal Fluid, Synovial Fluid, Ascitic Fluid.
- 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
- Bio Medical Waste Management: To learn & gain understanding of importance of proper and safe disposal of bio-medical waste & treatment, categories of biomedical waste, colour coding, types of containers, transportation of waste, etc.

Module 3

- Pre-analytical Laboratory Testing Process: 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.
- Introduction to Clinical Biochemistry: Electrolytes, Therapeutic Drug Monitoring, Acid Base Balance.

- Introduction to Bacteriology, Immunology and Serology
- Sensitization to Blood Banking Understand Immuno- hematology

Module 4

- Professional Behavior 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 & importance of conservation of resources in laboratories
- 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.

Module 5

- Observing & 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
- 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

Mode of Evaluation: The theory performance of students is evaluated as

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos												
S.No	Course Outcomes (COs)											Mapped programme Outcomes
1	To understand & 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.; 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.											1,2,3,4,5,6,7,8,9,10
	Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment & sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
	1	2	3	4	5	6	7	8	9	10	11	12
MLT 304	2	2	2	2	1	3	1	2	2	2		

1=Addressed to small extent

2=Addressed significantly

3=Major

part

of

course

MLT 354	Medical Laboratory Technician-I (P)	L	T	P	C
Version 1.0		0	0	6	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This program is aimed at training candidates for the job of a “Medical Laboratory Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

On completion of this course student will able 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.; 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.

Reference Books

12. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone
13. Anatomy for Nurses By Asha Latha
14. Essentials of Physiology by Sembulingam
15. Hand book of Health care quality & patient safety
16. Text book of Biochemistry by U. Satyanarayana
17. Text book of Medical Laboratory Technology by Godkar
18. Textbook of Microbiology By Presscott
19. Textbook of Parasitology by CP. Baveja
20. Textbook of Pathology by Harshamohan
21. Textbook of Immunology by S.K gupta
22. Textbook of Hematology & Clinical pathology by Ram das naik

Course Content:

- 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. Sample formats for equipment maintenance
20. Demonstration of procedure for hand hygiene
21. Demonstration of handling and disposal of Biomedical waste
22. Demonstration of biohazard bags for waste disposal
23. Demonstration of Grams staining
24. Demonstration of cultivation of bacteria
25. Demonstration of different sterilization methods
26. Demonstration of ABO Grouping
27. Demonstration of Rh typing
28. Demonstration of Cross matching of blood
29. Demonstration of investigating transfusion reactions
30. Demonstration of working of Semiautoanalyzer

Mode of Evaluation: The theory performance of students is evaluated as

	Practical	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Mapping between Cos and Pos		
S.No	Course Outcomes (COs)	Mapped programme Outcomes

MLT 305		Cytopathology				L	T	P	C
Version	To understand & describe the basic diagnostic services such as	Date of Approval	ability to perform clinical skills essentially	3	0	0	0	3	
Pre-requisites	cept or reject and store blood /urine/stool and tissue samples, etc.;								
Co-requisites	1								
	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.							1,2,3,4,5,6,7,8,9,10	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

	Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment & sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
	1	2	3	4	5	6	7	8	9	10	11	12
MLT 354	2	2	2	2	1	3	1	2	2	2		

Course Objectives

To understand the fundamental concept of cytopathology.

Course Outcomes

On completion of this course, the students will be able to understand fundamental aspects of Respiratory tract, Urinary tract, Female Genital tract's cytology, Techniques of collection of samples, Processing of samples by various staining Techniques like H&E, Romanowsky stains etc.

Catalog Description

This subject cytology is the branch of pathology, the medical specialty that deals with making diagnoses of diseases and conditions through the examination of tissue samples from the body and also involves study of cells in terms of structure, function.

Text Books

1. Hand
2. book of Exfoliative cytology; M.C. Lure, Lippincott
3. Clinical Diagnosis in Lab methods by Todd&Sanford
,1984

Reference Books

1. Lab Techniques WHO Manual Bio-safety ,2003
2. An Introduction to Medical Lab Technology by F J Baker and Silverton

Course Content

Module I

Techniques of collection of Samples

- a) Exfoliative cytology
- b) Interventional cytology

Exfoliative cytology

Techniques for collecting the smears from Female genital Tract

Pap smears- Lateral vaginal wall smears, vaginal pool vault, cervical smears, combined smears, triple smears, Endocervical & endometrial smears.

Module II

Respiratory tract:

Selection of material & making smears, Bronchial Aspiration(washings, & Brushings)

Urinary tract:

Collection & Preparation of samples

Urinary sediment cytology, Bladder irrigation(Washings) & cytology, Prostatic massage & its cytology

Module III

Body fluids

- a) Effusions in body cavities: Ascitic, Pleural, Etc..
- b) Fluids of small volume: CSF, Normal, Neoplastic & Non- neoplastic diseases

Module IV

Interventional cytology

Fine needle aspiration cytology, Imprint cytology, crush smear cytology, Biopsy sediment cytology.

Module V

Processing of samples in laboratory,

Staining smears: Papanicolus, H& E stain, Romonowsky stains like Leishman’s stain, May Grunwald Geimsa (MGG) & Wrights Stains.

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos														
Sl. No.	Course Outcomes (COs)													Mapped Programme Outcomes
1	To understand fundamental aspects of Respiratory tract,Urinary tract,Female Genital tract’s cytology ,Techniques of collection of samples ,Processing of samples by various staining Techniques like H&E,Romonowsky stains etc.													1,5,6,11,12
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning	
		1	2	3	4	5	6	7	8	9	10	11	12	
MLT 305	Cytopathology	3				1	2					1	2	

1=Addressed to small extent
2=Addressed significantly
3=Major part of course

MLT 306	Immunology & Bacterial serology	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the Immunology & Bacterial serology

Course Outcomes

On completion of this course, the students will be able to understand the basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases. It will also covers Auto Immune diseases, Types of vaccines & Vaccination schedule.

Catalog Description

This subject involves study of immunology & bacterial serology useful in laboratory diagnosis of various human infections & disease states

Text Books

1. Text book of Microbiology by Ananthanarayanan s
2. Text book of Microbiology: CP. Baveja
3. Text book of immunology by: SK: Gupate

Reference Books

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

Course Content:

Module I

Basic Immunology: History and introduction to immunology , Immunity Innate, Acquired immunity , Basic concepts about their mechanisms, Definition, types of antigens and determinants of antigenicity, Definition, types, structure and properties of immunoglobulin

Module II

Antigen Antibodies reaction: Antigen-Antibody reactions-Definition, Classification, General features and mechanisms , Applications of Precipitation, Agglutination, Immunodiffusion Complement fixation test, Immuno- fluorescence, RIA , ELISA

Module III

Serological Tests: Principle, procedure and interpretation of various serological tests: Widal VDRL, ASO, CRP, Brucella tube agglutination, Rose-Waaler,

Module IV

Complement system: Definition, complement activation pathways

Immune response: Introduction & Basic concepts of Humoral and Cellular immune responses

Module V

Auto Immunity: Basic concepts of autoimmunity and brief knowledge about autoimmune diseases

Vaccines: Definition, Types, Vaccination schedule

Mode of Evaluation:

The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos														
Sl. No.	Course Outcomes (COs)													Mapped Programme Outcomes
1	To understand the basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases. It will also covers Auto Immune diseases, Hypersensitive reactions, Types of vaccines & Vaccination shedule													1,5,6,11
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning	
		1	2	3	4	5	6	7	8	9	10	11	12	
MLT 306	Immunology & Bacterial serology	2				1	2					2		

- 1=Addressed to small extent
- 2=Addressed significantly
- 3=Major part of course

MLT 307	Research Methodology & Biostatistics	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This course deals with the study of Research Methodology & Biostatistics

Course Outcomes

Help the students to understand the basic principles of research and methods applied to draw inferences from the research findings. statistics course we will explore the use of statistical methodology in designing, analyzing, interpreting, and presenting biological experiments and observations.

Catalog Description

The subject involves the study of methods to be adapted to do research work data analysis and biostatistics

Text Books

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

Reference Books

1. Textbook of Methods in Biostatistics by B.K.Mahajan 7th Edition
2. Textbook of Biostatistics by B.Annadural

Course Content

Module I

Introduction to research methods , Identifying research problem

Module 2

Ethical issues in research, Research design

Module 3

Basic Concepts of Biostatistics, Types of Data, Research tools and Data collection methods

Module 4

Sampling methods, Probability rules & Probability distributions (Normal & Binomial)

Module 5

Developing a research proposal,

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory
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Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	To understand the basic principles of research and methods applied to draw inferences from the research findings. statistics course we will explore the use of statistical methodology in designing, analyzing, interpreting, and presenting biological experiments and observations.	1,2,3,5,6,8,10,,11,12											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 307	Research Methodology & Biostatistics	2	2	2		1	2		1		1	2	3

- 1=Addressed to small extent
2=Addressed significantly
3=Major part of course

MLT 308	Clinical Laboratory Practice(CLP)	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic Clinical Laboratory Practice

Course Outcomes

On completion of this course, the students will be able to understand the basic concept of laboratory services, infrastructure of laboratories, clinical laboratory procedures to help prevent harm to workers, property, the environment and the general public, help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system. Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Catalog Description

This subject involves study of good clinical laboratory practices used in organization and infrastructure of clinical laboratory, Ethical considerations to be followed, maintaining quality & safety in Laboratory, Bio medical Waste management etc

Text Books

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 Books

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

Course Content

Module I

Laboratory services : Levels of laboratories-Primary level, Secondary level and Tertiary level, Reference laboratories, Research laboratories and Specific disease reference laboratories. Accidents and emergencies in the laboratory

Module 2

Infrastructure in the laboratories; 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

Module 3

Bio medical waste management and environment safety- a. Definition of Biomedical Waste b.

Waste minimization c. BMW – Segregation, collection, transportation, treatment and disposal (including color coding) d. Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste e. BMW Management & methods of disinfection f. Modern technology for handling BMW

Module 4

Safety in Laboratories – General safety measures, biosafety precautions, levels of biosafety laboratories :BSL1,BSL2,BSL3,BSL4,BSL5,

Module 5

Ethical Considerations: Non- maleficence, beneficence, risk minimization, ethical review, transmission of ethical values, voluntariness, compliance. Quality Assurance –Internal and external Quality assessment

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos		
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes
1	To understand the basic concept of laboratory services, infrastructure of laboratories, clinical laboratory procedures to help prevent harm to workers, property, the environment and the general public, help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system. Legal and ethical considerations etc	1,2,3,5,6,8,10,11,12

		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 308	Clinical Laboratory Practice	3	1	2		2	3		2		1	2	3

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT309	Medical Laboratory Technician-II	L	T	P	C
Version 1.0		8	0	0	8
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This program is aimed at training candidates for the job of a “Medical Laboratory Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

On completion of this course student will be able 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.; 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.

Reference Books

23. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone
24. Anatomy for Nurses By Asha Latha
25. Essentials of Physiology by Sembulingam
26. Hand book of Health care quality & patient safety
27. Text book of Biochemistry by U. Satyanarayana
28. Text book of Medical Laboratory Technology by Godkar
29. Textbook of Microbiology By Prescott
30. Textbook of Parasitology by CP. Baveja
31. Textbook of Pathology by Harshamohan
32. Textbook of Immunology by S.K gupta
33. Textbook of Hematology & Clinical pathology by Ram das naik

COURSE CONTENT

Module I

- Patient’s Rights & Responsibilities: Understand sensitivities involved in patient’s right, Learn medical laboratory technician’s role in maintaining patient's rights.
- Introduction to Histopathology: Brief introduction of histopathology, Elementary knowledge of specimen collection, tissue fixatives, Tissue processing, section cutting, Staining, Decalcification.
- 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.
- 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.

Module 2

- Introduction to Advanced techniques and future trends in laboratory science-I: Updated on advanced techniques and future trends in field of biochemistry, haematology & blood banking, field of clinical pathology, histopathology & cytopathology.
- 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.
- 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

Module 3

- Fine needle Aspiration: Understand the purpose of fine needle aspiration, procedure of fine needle aspiration, & section cutting
- Introduction to Parasitology, Mycology and Virology, Describe the Morphology, pathogenicity and laboratory diagnosis of human viruses.

- **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.

Module 4

- **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
- **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

Module 5

- **Soft Skills and Communications Theory Duration:** Understand Art of Effective Communication, Able to handle effective Communication with, Patients & 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 & 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

Mode of Evaluation: The theory performance of students is evaluated as

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos												
S.No	Course Outcomes (COs)											Mapped Programme Outcomes
1	To understand & 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.; 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.											1,2,3,4,5,6,7,8,9,10
	Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment & sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
	1	2	3	4	5	6	7	8	9	10	11	12
MLT309 (T)	2	2	2	2	1	3	1	2	2	2		

1=Addressed to small extent

2=Addressed significantly

3=Major

part

of

course

MLT 355	Immunology & Bacterial serology (Practical)	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the practicals of Immunology & Bacterial serology

Course Outcomes

On completion of this course, the students will be exposed to Perform various Serological tests like Widal, VDRL, ASO, RF tests etc, demonstration of Ag or Ab by immunofluorescence/immunodiffusion techniques, and performing ELISA, SDS-PAGE techniques etc

Catalog Description

This subject involves study of immunology & bacterial serology useful in laboratory diagnosis of various human infections & disease states

Text Books

1. Text book of Microbiology by Ananthanarayanan s
2. Text book of Microbiology: CP. Baveja
3. Text book of immunology by: SK: Gupate

Reference Books

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

Course Content:

1. Collection of blood sample by vein puncture, separation and preservation of serum
2. Performance of Serological tests
 - a. Widal Test
 - b. VDRL (including Antigen Preparation),
 - c. ASO (Anti streptolysin 'O')
 - d. C-Reactive Protein (Latex agglutination)
 - e. Rheumatoid factor (RF) Latex agglutination
3. Demonstration of antigen / antibody determination by Immuno fluorescence (IF), Immuno diffusion, precipitation in Agarose gel (Ouchterlony)
4. Demonstration of ELISA
5. Demonstration of SDS - PAGE
6. Preparation of Vaccination schedule

Mode of Evaluation:

The theory performance of students is evaluated as:

	Lab
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Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	To understand the basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases. It will also covers Auto Immune diseases, Hypersensitive reactions, Types of vaccines & Vaccination shedule	1,5,6,8,11,12											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 355	Immunology & Bacterial serology(P)	3				1	2		1			2	2

1=Addressed to small extent

2=Addressed significantly

3=Major

part

of

course

MLT356	Medical Laboratory Technician-II (P)	L	T	P	C
Version 1.0		0	0	6	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

This program is aimed at training candidates for the job of a “Medical Laboratory Technician”, in the “Healthcare” Sector/Industry and aims at building the following key competencies amongst the learner

Course Outcomes

On completion of this course student will able 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.; 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.

Reference Books

34. Introduction to Medical laboratory technology by J. Baker, R.E. Silverstone
35. Anatomy for Nurses By Asha Latha
36. Essentials of Physiology by Sembulingam
37. Hand book of Health care quality & patient safety
38. Text book of Biochemistry by U. Satyanarayana
39. Text book of Medical Laboratory Technology by Godkar
40. Textbook of Microbiology By Presscott
41. Textbook of Parasitology by CP. Baveja
42. Textbook of Pathology by Harshamohan
43. Textbook of Immunology by S.K gupta
44. Textbook of Hematology & Clinical pathology by Ram das naik

Course Content:

- 1. Demonstration of working of spectrophotometer**
- 2. Demonstration of maintenance of equipments 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
30. Ethics of hospital setup

Mode of Evaluation: The theory performance of students is evaluated as

	Practical	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Mapping between Cos and Pos		
S.No	Course Outcomes (COs)	Mapped

		programme Outcomes
1	To understand & 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.; 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.	1,2,3,4,5,6,7,8,9,10

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

	Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment & sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
	1	2	3	4	5	6	7	8	9	10	11	12
MLT356 (P)	2	2	2	2	1	3	1	2	2	2		

MLT 357	Cytopathology(Practical)	L	T	P	C
Version	Date of Approval:	3	0	0	3
Pre-requisites//Exposure					
Co-requisites					

Course Objectives

To understand the basic Cytology Practical

Course Outcomes

On completion of this course, the students will be able to understand preparation of reagents, Wet film preparation ,Staining(H&E, Pap) of Vaginal,Cervical,Sputum, FNAC etc

Catalog Description

This subject cytology is the branch of pathology, the medical specialty that deals with making diagnoses of diseases and conditions through the examination of tissue samples from the body and also involves study of cells in terms of structure, function.

Text Books

1. Hand book of Exfoliative cytology; M.C. Lure, Lippincott
2. Clinical Diagnosis in Lab methods by Todd&Sanford ,1984

Reference Books

3. Lab Techniques WHO Manual Bio-safety ,2003
4. An Introduction to Medical Lab Technology by F J Baker and Silverton

Course Content

1. Collection & Preparation of Vaginal,Cervical,Sputum smears
2. Preparation of Wet film
3. Demonstration of Fixation
4. Demonstration of H&E Staining
5. Demonstration of Pap smear preparation
6. Demonstration of Fine Needle Aspiration Cytology(FNAC)
7. Demonstration of Vaginal,Cervical,Sputum staining

Mode of Evaluation: The theory performance of students is evaluated as:

	Theory	
Components	Internal	SEE
Marks	30	70
Total Marks	100	

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between Cos and Pos													
Sl. No.	Course Outcomes (COs)	Mapped Programme Outcomes											
1	To understand anatomy of different body systems and functions exhibited by these systems in our body.	1,5,6,8,11,12											
		Medical Lab Technology Knowledge	Thinking Abilities	Planning abilities	Leadership skills	Professional Identity	Medical Lab Technology and society	Environment and sustainability	Ethics	Individual or team work	Communication	Modern & Usage	Life-long Learning
		1	2	3	4	5	6	7	8	9	10	11	12
MLT 357	Cytopathology(P)	3				1	2		1			2	2

1=Addressed to small extent

2=Addressed significantly

3=Major part of course

MLT401	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(VII and VIII semesters) under the supervision of Lab super indent/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:

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

MLT402	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((VII and VIII semesters) under the supervision of Lab super indent/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:

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