THE ASSAM ROYAL GLOBAL UNIVERSITY

ROYAL SCHOOL OF MEDICAL AND ALLIED SCIENCES (RSMAS)

DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY (MLT)

COURSE STRUCTURE AND SYLLABUS FOR B.SC. IN MLT (Four Year Under-Graduate Program)

W.E.F

AY - 2025- 2026

(Based on National Education Policy 2020)

Semester-wise and component wise distribution of credit (Four Year UGP – Single Major)

1st SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M101/MLT242M111	Basic Anatomy & Human Physiology (Theory+ Lab)	100	4	3-0-2
Major (Core)	MLT242M102	Orientation to Medical laboratory Technology	100	4	4-0-0
Interdisciplinary (IDC)	IKS992I101	IKS-I	100	3	2-1-0
Ability Enhancement course (AEC)	CEN982A101	Communicative English I	100	1	1-0-0
Ability Enhancement course (AEC)	BHS982A102	Behavioural Science I	100	1	1-0-0
Skill Enhancement Course (SEC)	MLT242S111	Hospital Duty and Patient Care (HDPC)	100	4	0-0-8
Value Added Course (VAC)	-	Selected from the pool of courses offered	100	3	3-0-0
SWAYAM Course	MOOC (SWAYAM COURSE)			3	
			TOTAL CREDIT FOR 1st SEMESTER	23	
2nd SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M201/MLT242M211	Fundamentals of biochemistry (Theory +Lab)	100	4	3-0-2
Major (Core)	MLT242M202/MLT242M212	Basic Microbiology (Theory +Lab)	100	4	3-0-2
IDC	IKS992I201	IKS-2	100	3	2-1-0
AEC	CEN982A201	Communicative English II	100	1	1-0-0
AEC	BHS982A202	Behavioural Science II	100	1	1-0-0
SEC	MLT242S211	Diagnostic Instrumentation I	100	4	0-0-8
VAC	-	Selected from the pool of courses offered	100	3	3-0-0
SWAYAM Course	MOOC (SWAYAM COURSE)			3	
			TOTAL CREDIT FOR 2nd SEMESTER	23	
3rd SEMESTER					

COMPONENT	COURSE CODE	COURSE TITLE	LEVEL	CREDIT	L-T-P
Major (Core)	MLT242M301/MLT242M311	Immunology and Serology (Theory + Lab)	200	4	3-0-2
Major (Core)	MLT242M302/MLT242M312	Advanced clinical Biochemistry (Theory + Lab)	200	4	3-0-2
Major (Core)	MLT242M303/ MLT242M313	Basic Hematology (Theory + Lab)	200	4	3-0-2
Major (Core)	MLT242M304	Clinical Pathology	200	3	3-0-0
IDC	MLT242I301	Fundamentals of MLT (offered to other departments)	200	3	3-0-0
AEC	CEN982A301	Communicative English-III	200	1	1-0-0
AEC	BHS982A302	Behavioral Science-III	200	1	1-0-0
SWAYAM Course	MOOC (SWAYAM COURSE)			3	
		TOTAL CREDIT FOR 3rd SEMESTER		23	
4th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M401/MLT242M411	Advanced Haematolgy (Theory+Lab)	200	4	3-0-2
Major (Core)	MLT242M402/MLT242M412	Histopathology & Cytopathology (Theory+Lab)	200	4	3-0-2
Major (Core)	MLT242M403/MLT242M413	Systemic bacteriology (Theory + Lab)	200	4	3-0-2
Major (Core)	MLT242M404	Applied Pathology	200	3	3-0-0
Major (Core)	MLT242M405	Biomedical Waste Management	200	3	3-0-0
AEC	CEN982A401	Communicative English-IV	200	1	1-0-0
AEC	BHS982A402	Behavioural science-IV	200	1	1-0-0
SWAYAM Course	MOOC (SWAYAM COURSE)			3	
		TOTAL CREDIT FOR 4th SEMESTER		23	
5th SEMESTER					
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M501/MLT242M511	Mycology (Theory+Lab)	300	4	3-0-2
Major (Core)	MLT242M502/MLT242M512	Diagnostic Molecular Biology (Theory+Lab)	300	4	3-0-2
Major (Core)	MLT242M503/MLT242M513	Basic Blood Banking (Theory+Lab)	300	4	3-0-2

Major (Core)	MLT242M504/MLT242M514	Clinical Parasitology (Theory+Lab)	300	4	3-0-2
Major (Core)	MLT242I521	Clinical Posting	300	4	-
		TOTAL CREDIT FOR 5th SEMESTER		20	
		6th SEMESTER			
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M601/MLT242M611	Virology (Theory+Lab)	300	4	3-0-2
Major (Core)	MLT242M602/MLT242M612	Advanced Blood Banking (Theory+Lab)	300	4	3-0-2
Major (Core)	MLT242M603	Enzymology & Nutrition	300	3	3-0-0
Major (Core)	MLT242M604	Medical Law and Patient Safety	300	3	3-0-0
Major (Core)	MLT242M605	Biostatistics and Research Methodology	300	3	3-0-0
Major (Core)	MLT242M606	Quality control and Bio safety	300	3	3-0-0
		TOTAL CREDIT FOR 6th SEMESTER		20	
		7th SEMESTER			
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M711	Techniques in Clinical Pathology and Body Fluid Analysis	400	4	0-0-8
Major (Core)	MLT242M712	Analytical Techniques in Clinical Biochemistry	400	4	0-0-8
Major (Core)	MLT242M713	Clinical Hematology and Coagulation Studies	400	4	0-0-8
Major (Core)	MLT242M714	Histopathological and Cytological Techniques	400	4	0-0-8
Major (Core)	MLT242M715	Microbiological Methods and Culture Techniques	400	4	0-0-8
		TOTAL CREDIT FOR 7th SEMESTER		20	
		8th SEMESTER			
COMPONENT	**COURSE CODE**	**COURSE TITLE**	**LEVEL**	**CREDIT**	**L-T-P**
Major (Core)	MLT242M811	Immunological and Serological Testing	400	4	0-0-8
Major (Core)	MLT242M812	Blood Banking and Transfusion Technology	400	4	0-0-8
	MLT242M822	Project / Dissertation	400	12	
		TOTAL CREDIT FOR 8th SEMESTER		20	
		TOTAL CREDITS		172	

SYLLABUS (1st SEMESTER)

Level: Semester -I

Detailed Syllabus

Name of the Subject: Basic Anatomy & Human Physiology (Theory +Lab)		**Type of Course: Major**
Paper Code: MLT242M101/ MLT242M111		**Course Level: 100**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Human Anatomy and Physiology.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic knowledge on the structure and function of the human body.	**BT 1**
CO 2	**Explain** the relation between the different organs and circulating system and the importance of body immunity, blood coagulation, blood grouping etc.	**BT 2**
CO 3	**Organize a**pplication of anatomical knowledge with various diseases. **Apply** the acquainted knowledge about the digestive system and its different role and actions.	**BT 3**
CO 4	**Analyse** the various experiments related to special senses and nervous system.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	General Anatomy: Introduction to Anatomy, terms and terminology. Regions of Body, Cavities and systems. Surface anatomy – Musculo- skeletal, vascular, cardiopulmonary system General Embryology. Applied anatomy Musculoskeletal system: Connective tissue & its modification, tendons, membranes, special connective tissue. Bone structure, blood supply, growth, ossification, and classification. Muscle classification, structure and functional aspect. Joints – classification, structures of joints, movements, range, limiting factors, stability, blood supply, nerve supply, dislocations and	16

	applied anatomy.	
II	Hypothalamus Structure and features of meninges Ventricles of brain, CSF circulation Development of nervous system & defects Cranial nerves – (course, distribution, functions, and palsy) Sympathetic nervous system, its parts and components Parasympathetic nervous system Applied anatomy. Sensory system: Structure and function of, Visual system, Auditory system, Gustatory system, Olfactory system, Somato sensory system.	16
III	General Physiology- Cell: morphology, Structure and function ofcell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, Homeostasis. Blood- Introduction-composition & function of blood, W.B.C., R.B.C., Platelets formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Proteins: -types &functions, Blood Groups- types, significance, determination Hemoglobin, Haemostasis, Lymph-composition, formation, circulation &functions	16
IV	Cardiovascular system- Conducting system- components, impulse conduction, Heart valves, Cardiac cycle-definition, phases of cardiac cycle, Cardiac output- definition, normal value, determinants. Stroke volume and its regulation, Heart rate and its regulation, Arterial pulse, Blood pressure-definition, normal values, factors affecting blood pressure, Shock-definition, classification, causes and features, Basic idea of ECG, Cardiovascular changes during exercise. Nerve Muscle Physiology- Muscles- classification, structure, properties, Excitation contraction coupling, Motor unit, EMG, factors affecting muscle tension,Muscle tone, fatigue, exercise, Nerve –structure and function of neurons, classification, properties, Resting membrane potential & Action potential their ionic basis, All or None phenomenon, Neuromuscular transmission, Ionic basis of nerve conduction, Concept of nerve injury &Wallerian degeneration, Synapses, Electrical events in postsynaptic neurons, Inhibition & facilitation at synapses, Chemical transmission of synaptic activity, neurotransmitters.	16
TOTAL		64

Title of the Paper: Basic Anatomy & Human Physiology (Lab) Paper code: MLT242M111

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Identification and description of all anatomical structures. The learning of Anatomy is by demonstration only through dissected parts, slides.	9
II	Demonstrationof skeleton- articulated and disarticulated. Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).	9
III	Identification of blood cells by study of peripheral blood smear. Introduction to hemocytometry. Enumeration of white blood cell (WBC) count. Determination of blood group. Determination of erythrocyte sedimentation rate (ESR). Recording of blood pressure. Special senses Structure and functions of eye, ear, nose and tongue and their Determination of heart rate and pulse rate disorders.	9
IV	Enumeration of total red blood corpuscles (RBC) count Determination of bleeding time Determination of clotting time Estimation of hemoglobin content	9
	TOTAL	36

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- The students are acquainted with normal bodily functions(homeostasis) and learn the capacity to distinguish what is normal state and diseased state.
- Students examine the effectiveness of yoga poses as experiential learning techniques for the musculoskeletal system.
- They can learn experientially about the blood pressure measurement and learn about hypertension and hypotension.
- They can visit Anatomy and Physiology Lab and learn about the physiology and anatomy with the help of skeleton models and physiology models.

Texts:

1. Alison,G.Anne,W.(2014). Ross and Wilson Anatomy and Physiology in Health and

Illness. Elsevier Health; UK, 13th edition
2. Anand&Manchanda,Textbook of Physiology, Tata McGrawHill. 5th Edition
3. Sembulingam.K,Human Physiology- Vol. 1&2,MedicalAllied, 7th Edition.
4. Singh, S.H. (2017). Principles of human physiology for allied health sciences: CBS Publishers & Distributors

Reference Book:

1. Tortora,GJ. &Derrickson. (2008). Principles of Anatomy and Physiology. Wiley, Global edition.
2. Venkatesh D. Sudhakar H.H. (2016). Basics of anatomy, physiology &microbiology level 1: CBS Publishers & Distributors, 4th edition
3. YalayyaswamyN.N.(2018). Human anatomy and physiology for courses in nursing and allied health sciences, 3rd edition

Name of the Subject: Orientation to Medical laboratory Technology		**Type of Course: Major**
Paper Code: MLT242M102		**Course Level: 100**
Total credits: 4	**Scheme of Evaluation: T**	**T-P-C: 4-0-0-4**

Course Objectives: The course is designed to provide a wholesome Understand the basic concept on Medical laboratory Technology and orient the students regarding the course.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Bloom's Taxonomy Level**
CO 1	**Recall** the scope, importance, and responsibilities of medical laboratory professionals in healthcare.	**BT 1**
CO 2	**Explain** the importance of ethical principles and code of conduct for laboratory professionals and able to explain the working of lab instruments.	**BT 2**
CO 3	**Develop** the ethical principles and code of conduct for laboratory professionals.	**BT 3**
CO 4	**Analyze** how diagnostic technology has evolved to support modern healthcare.	**BT 4**

DETAILED SYLLABUS:

Modules	Topics (if applicable) & Course Contents	Periods
I	Definition and Goals- History of Laboratory Medicine Scope of MLT, -Basic Laboratory Principles- Code of conduct of Laboratory Personnel- Significance of diagnosis – Conventional methods of diagnosis –Role of Lab Technician	**22**
II	Organization of Lab and Design- Importance of Health care – Misdiagnosis –Lab Medicine- Quality Matrics - Basic equipments- Calibration- Record Maintenance- Purchase- Consumables- Non consumables – Reports -	**22**
III	General approach to specimen collection, transport and disposal - Safety measures- Pre analytical Phase – Post analytical Phase of Diagnosis- Preparation of Report and Interpretation Medical laboratory professional - professionalism in laboratory workers, code of conduct, communication between physician and lab technician-	**22**
IV	Basic Techniques- Basics of emergency care and life support skills - first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR -	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
88	**00**	**32**

Experiential learning activities may include:

- Students can create physical models or visual models or visual representations of the lab infrastructure.
- Students performed tests in the royal diagnosticlab.
- Students visit to BBCI and GMCH for diagnostic exposure

Textbook:

1. P. Godkar; Textbook of Medical Laboratory Technology, 3rd edition (Revised Reprint 2021), Bhalani Publishing House.
2. Barbara J. Bain, Imelda Bates, & Mike A. Laffan; Dacie and Lewis Practical Hematology, 12th edition (2016), Elsevier Health Sciences.

Recommended Books

1. Ramnik Sood; Medical Laboratory Technology: Methods and Interpretation Vol. 1& 2, 6th edition (2009), Jaypee Brother Publishing house.
2. Harald Theml, Heinz Diem & T. Haferlach; Color Atlas of Hematology Practical Microscopic and Clinical Diagnosis, 2nd edition (2004), Thieme

Semester -I

Detailed Syllabus

Name of the Subject: Hospital Duty and Patient Care (HDPC)		**Type of Course: SEC**
Paper Code: MLT242S111		**Course Level: 100**
Total credits: 4	**Scheme of Evaluation: P**	**L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Hospital Duty and Patient Care

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** on the importance of quality control, and other processes required for patient care and hospital management.	**BT 1**
CO 2	**Classify** the chart on quality control, the methods to deal with poisoning and management of the outcome.	**BT 2**
CO 3	**Apply** the knowledge on practical aspect to deal with critical cases, to treat patients with drugs poisoning and on the process of automatic techniques.	**BT 3**
CO 4	**Analyze** the waste categories, analyse the symptoms of poisoning, legal aspects in medical profession and will be able to perform quality control.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**

I.	Concept of accuracy, precision, reliability, reproducilibilty, reference ranges, Quality control, LJ graph, collection, distribution, preservation, storage of specimen for appropriate test, introduction to NABL, NABH and ISO guidelines, Automatic Techniques	**22**
II	Poisoning: Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide poisoning, Legal hazards of medical profession: Malpractice, Clinical negligence, Corporate negligence	**22**
III	Drugs: Definition, Names & classification of drugs, Different preparations of drugs, Adverse effects of drugs, Different routes of drug administration, Consumer protection Act:	**22**
IV	Bio-medical waste – Introduction, Waste Generation Segregation, Disposal, Planning, Objectives, Policies of BMW Management, Management of Bio-medical Waste, Technologies for Treatment for BMW, Training, Occupational Safety and Health Issues, Criteria for selecting appropriate Medical Waste Technologies	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**88**	**32**

Experiential learning activities may include:

- Students can classify the different types of biomedical waste
- Students can understand the different types of error occurring in the laboratory
- Students can discuss on the different type of diagnosis and treatment required for patient care.

Recommended Books:

- Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states.
- The Book of Hospital Waste Management: Dr. D.B. Acharya & Dr. Meeta Singh (Minerva Press, New Delhi)
- Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications

Reference Book:

- Hugo W.B and Russel A.D, Pharmaceutical Microbiology, 7thedn, 2004, Blackwell Scientific publications, Oxford London.

- Hospital Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi)
- Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications

Level: Semester I

Detailed Syllabus

Name of the Subject: Introduction to Indian Knowledge System – I		**Type of Course: Interdisciplinary**
Paper Code: IKS992I101		**Course Level: 100**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 2-1-0-3**

Course Objectives

This Foundation course is designed to present an overall introduction to all the streams of IKS relevant to the UG program. It would enable students to explore the most fundamental ideas that have shaped Indian Knowledge Traditions over the centuries.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the rich heritage of Indian knowledge systems	**BT 1**
CO 2	**Describe** the contribution of Indian knowledge systems to the world	**BT 2**
CO 3	**Demonstrate** knowledge of sociocultural and ethnolinguistic diversity that constitutes the soul of Bharatvarsha	**BT 2**
CO 4	**Apply** traditional knowledge and techniques in day-to-day life	**BT 3**
CO 5	**Distinguish** knowledge traditions that originated in the Indian subcontinent	**BT 3**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Introduction to Indian Knowledge Systems (IKS):** -What is the Indian Knowledge System? -Definition of Indigenous/ Traditional Knowledge -Scope, and Importance of Traditional Knowledge.	**15**

	Ancient India- Bharat Varsha: -People of Ancient Bharat Varsha -Our great natural heritage: The great Himalayas and the rivers. - The civilizations of the Sindhu-Ganga valley, and the Brahmaputra valley. -Our coastal plains. -Our Nature: Forests and Minerals -Ancient Indian Traditional Knowledge and Wisdom about nature and climate.	
II	**Indian Heritage of Knowledge:** -Ancient Indian Knowledge: The *Vedas* and its components-the *Vedangas* -Ancient Indian books and treaties: The *Sastras*. -The Great Indian Epics: The Ramayana and The Mahabharata, -Epics and religious treaties of ancient Assam: Introduction to Madhav Kandali's *Ramayan* and Srimanta Sankardev's *Dasam Skandha Bhagavat* of the Puranas. -Ancient Traditional Knowledge-The *Agamas* -The ancient Buddhist knowledge: *Tripitaka: Vinaya, Sutta* and *Abhidhamma Pitaka* **Languages and language studies in India:** -What is linguistics? -Script and Language -Alphabet of the Indian languages *Varnamala:* Origin, Evolution, and phonetic features. -Languages of India -Important texts of Indian languages: Skills *Siksha,* Expression/Prounciation-*Nirukta,* Grammer-*Vyakarana,* Poetic rhythm-*Chandas.* -Paninian Grammar: A Brief Introduction **Introduction to Fine Arts and Performing Arts of India:** -Ancient Indian classical music and dance forms: The Science of Dramas-*Natyasastra* and the Science of Music-*Gandharva-Veda.* *-Aesthetics in Indian Art and Culture.* -Folk music and traditional dance forms of the Northeast.	**15**
III	**Indian Science & Technology** -Ancient India's contribution to Mathematics- Number System. Algebra and Arithmetic, Geometry and Trigonometry. -Origin of Decimal system in India; nomenclature of numbers in the Vedas. Zero and Infinity. Sulba-sutras. Contribution of Brahmagupta and Sridhar Acharya to Mathematics. Important texts of Indian mathematics. • **Indian Astronomy:** Planetary System. Motion of the Planets. Velocity of Light. Eclipse. Astronomy. Navagrahas. Important works in Indian Astronomy. Aryabhata and Nilakantha: Contribution to Astronomical Studies • **Indian Metal Works:** Mining Techniques. Types of Metals. Tools & Techniques for Metal Smelting with examples. Metalworks in pre-modern India: Special reference to NE India.	**15**

IV	**Contribution of Ancient India to Health Sciences:** -Traditional Indigenous systems of medicines in India: - *Ayurveda* and *Yoga:* Elements of *Ayurveda: Gunas* and *Doshas*, *Pancha Mahabhuta* and *Sapta-dhatu*. -Concept of disease in Ayurveda -Ayurvedic lifestyle practices: *Dinacharya* and *Ritucharya.* -Important Ayurvedic Texts -Hospitals in Ancient India -*Ayurveda*: Gift of India to the modern world.	**15**
TOTAL		**60**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60	**00**	**30**

The experiential learning sessions may include:

- Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.
- Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.
- Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.
- Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems.
- Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students.

Text Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. (2022), Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning Private Ltd.
2. Mukul Chandra Bora, Foundations of Bharatiya Knowledge System. Khanna Book Publishing

Reference Book:

1. Baladev Upadhyaya, *Samskrta Śāstrom ka Itihās*, Chowkhambha, Varanasi, 2010.
2. D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., *A Concise History of Science in India*, 2nd Ed., Universities Press, Hyderabad, 2010.
3. Astāngahrdaya, Vol. I, *Sūtrasthāna and Śarīrasthāna*, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.
4. Dharampal, *The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century*, Dharampal Classics Series, Rashtrotthana Sahitya, Bengaluru, 2021.
5. J. K. Bajaj and M. D. Srinivas, *Indian Economy, and Polity in Eighteenth-century Chengalpattu*, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995, pp. 63-84.

Level: Semester I

Detailed Syllabus

Name of the Subject: Introduction to Effective Communication **Type of Course: AEC**

Paper Code: CEN982A101 **Course level:** 100

Total credits: 1 **Scheme of Evaluation: T** **L-T-P-C:** 1-0-0-1

Course Objectives

To understand the four major aspects of communication by closely examining the processes and figuring the most effective ways to communicate with interactive activities.

Course Outcomes:

CO Level	Course Outcome	Blooms Taxonomy Level
CO 1	**List** the elements and processes that make for successful communication and **recognise** everyday activities that deserve closer attention in order to improve communication skills	**BT 1**
CO 2	**Contrast** situations that create barriers to effective communication and **relate** them to methods that are consciously devised to overcome such hindrance	**BT 2**
CO 3	**Apply** language, gestures, and para-language effectively to avoid miscommunication and **articulate** one's thoughts and build arguments more effectively	**BT 3**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction to Effective Communication • Listening Skills - The Art of Listening - Factors that affect Listening - Characteristics of Effective Listening • Guidelines for improving Listening skills	**5**
II	• Speaking Skills - The Art of Speaking - Styles of Speaking - Guidelines for improving Speaking skills - Oral Communication: importance, guidelines, and 5 barriers	**5**
III	• Reading Skills - The Art of Reading - Styles of Reading: skimming, surveying, scanning • Guidelines for developing Reading skills	**5**

IV	• Writing Skills - The Art of Writing - Purpose and Clarity in Writing - Principles of Effective Writing	**5**
TOTAL		**16**

Text Books:

1. Rizvi, M. Ashraf. (2017). *Effective Technical Communication*. McGraw-Hill.

Reference Books:

1. Chaturvedi, P. D. and Chaturvedi, Mukesh. (2014). *Business Communication.* Pearson.
2. Raman, Meenakshi and Sharma, Sangeeta. (2011). Technical Communication: Principles and Practice (2nd Edition): Oxford University Press.

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
15 hrs	**-**	10 hours - Movie/Documentary /Podcasts screening - Peer teaching

Level: Semester I

Detailed Syllabus

Name of the Subject: Behavioural Sciences -1 **Type of Course: AEC**

Paper Code: BHS982A102 **Course level:** 100

Total credits: 1 **Scheme of Evaluation: T** **L-T-P-C:** 1-0-0-1

Course Outcomes:

CO Level	Course Outcome	Blooms Taxonomy Level
CO 1	**Understand** self & process of self exploration	**BT 1**
CO 2	**Learn** about strategies for development of a healthy self esteem	**BT 2**

CO 3	**Apply** the concepts to build emotional competencies.	**BT 3**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Introduction to Behavioral Science** Definition and need of Behavioral Science, Self: Definition components, Importance of knowing self, Identity Crisis, Gender and Identity, Peer Pressure, Self image: Self Esteem, Johari Window ,Erikson's model.	**4**
II	**Foundations of individual behavior** Personality- structure, determinants, types of personalities. Perception: Attribution, Errors in perception. Learning- Theories of learning: Classical, Operant and Social.	**4**
III	**Behaviour and communication.** Defining Communication, types of communication, barriers to communication, ways to overcome barriers to Communication, Importance of Non-Verbal Communication/Kinesics, Understanding Kinesics, Relation between behaviour and communication.	**4**
IV	**Time and Stress Management** Time management: Introduction-the 80:20, sense of time management, Secrets of time management, Effective scheduling. Stress management: effects of stress, kinds of stress-sources of stress, Coping Mechanisms. Relation between Time and Stress.	**4**
TOTAL		**16**

Text books

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc
- K.Alex, Soft skills; S.Chand.

SYLLABUS (2nd SEMESTER)

Semester -II

Detailed Syllabus

Name of the Subject: Fundamentals of Biochemistry (Theory +Lab)		**Type of Course: Major**
Paper Code: MLT242M201/ MLT242M211		**Course Level: 100**
Total credits: 4	**Scheme of Evaluation: T +P**	**L-T-P-C: 3-0-2-4**

Course Objectives: The course is designed to provide a wholesome understand the basic chemistry of nutrients required by our body

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Bloom's Taxonomy Level**
CO 1	**Recall** the core knowledge of metabolism of Carbohydrates, lipids, nucleic acids and their applied aspects.	**BT 1**
CO 2	**Explain** the role, classifications, and functions of lipids, carbohydrates, and proteins.	**BT 2**
CO 3	**Develop** a wide knowledge of the nucleic acids, DNA, RNA and their applied importance.	**BT 3**
CO 4	**Analyze** the various biochemical experiments related to carbohydrates, proteins and fats etc	**BT 4**

DETAILED SYLLABUS:

Modules	Topics (if applicable) & Course Contents	Periods
I	CARBOHYDRATES: Definition and classification of carbohydrates Common carbohydrates (Glucose, Fructose, Starch, Glycogen, Starch) and their sources. Biological significance of Carbohydrate	16
II	PROTEINS: Definition of Proteins along with the biological significance. Amino acids and its classification Essential and Non-essential amino acids	16
III	LIPIDS: Definition and classification of lipids. Classification of Fatty Acids with examples and functions of some common lipids (Phospholipids, Glycolipids, Steroids).	16

IV	NUCLEIC ACIDS: Basic idea of the structure of DNA and RNA, Function of DNA and RNA acid-base buffers, Basic idea of acids, bases, Ph, buffer Acid base balance	16
TOTAL		64

Title of the Paper: Fundamentals of Biochemistry (Lab) **Paper code: MLT242M211**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	To study the general laboratory safety rules. To demonstrate glasswares, apparatus and plasticwares used in laboratory.	**9**
II	To collect blood samples Anticoagulant vials. Code of conduct of medical laboratory personnel.	**9**
III	Preparation of different percentage solution Preparation of normal and molar solution. Hazard signs and precautions to be taken in case of acid, base, burns.	**9**
IV	Demonstration of photocolorimeter Demonstration of centrifuge. Demonstration of ph meter Demostration of spectrophotometer.	**9**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Preparation of model of DNA
- Creating physical models of different carbohydrate structure
- Students can create physical models or visual models or visual representations of the Krebs cycle.

- Students performed biochemistry tests in the royal diagnosticlab.
- Students visit to BBCI and GMCH for diagnostic exposure

Textbook:

1. Leininger , Principles of Biochemistry. 7th Edition, 2017.
2. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell., Harper's Biochemistry. 30th Edition, 2015
3. D. Satyanarayana and Chakrapani, Biochemistry.5th Edition, 2017.

Reference Book:

1. Robert Horton H, Laurence A Moran, Gray Scrimgeour K. Principles of Biochemistry, 4th Edition, 2006, Pearsarson Publisher. ISBN-13: 978-0321707338
2. Conn and Stumpf, Outlines of Biochemistry, 5th Edition, 2006.

Semester -II

Detailed Syllabus

Name of the Subject: Basic Microbiology (Theory +Lab)		**Type of Course: Major**
Paper code: MLT242M202/ MLT242M212		**Course Level: 100**
Total credits: 4	**Scheme of Evaluation: T +P**	**L-T-P-C: 3-0-2-4**

Course Objectives:

This course has been formulated to impart comprehensive knowledge on Microbiology. The students will learn to identify and classify bacteria, as well as different medias used to identify microorganisms.

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the microorganisms name and relate their growth and nutrition factors.	**BT 1**
CO 2	**Classify** the different media used for growth and nourishment of microbes	**BT 2**
CO 3	**Apply** a basic technique of Microscopes and its importance.	**BT 3**
CO 4	**Analyze** the morphology, pathogenesis and laboratory diagnosis of the microorganisms.	**BT 4**

DETAILED SYLLABUS

Modules	Course Content	Periods
I.	Introduction to Microbiology: Microscopy, Bright-field Microscopy, Dark field Microscopy, Phase contrast Microscopy, Fluorescence Microscopy, Electron Microscopy Transmission electron Microscopy, Scanning electron Microscopy Stains in microbiology:Preparation of smear, simple staining, classification of stains: Gram staining, Acid fast staining, Negative staining	**16**
II.	Shapes and structure of bacteria: Bacterial cell- structure and function, capsule, spores, flagella, Virulence factor of Bacteria, Operation and Principles of Incubator, Autoclave, Hot air oven, Inspissator, Distillation plant.	**16**
III.	Microbial Nutrition, Growth, and control Nutritional requirements (C, N,H,O,S,P)\ Nutritional types of Micro-organisms, Growth factors. Sterilisation and disinfection. Definition, Classification, Antisepsis, Autoclave, Dry heat, Sterilisation, Moist heat Sterilisation	**16**
IV	Bacteriological media and their composition, Simple Media. Differential Media, Special media, Enhancement media. Culture methods: Streak culture, Lawn culture, Stroke culture, stab culture, pour plate culture, liquid culture.	**16**
TOTAL		**64**

Title of the Paper: Basic microbiology (Lab) **Paper code: MLT242M212**

Detailed Syllabus

Modules	Topics (if applicable) & Course Contents	Periods
I.	Care and operation of Microscopes viz. Light, Dark ground, Phase contrast, Inverted, Fluorescent microscopes. Collection of specimens for Microbiological investigations such as blood, urine,	**9**

	throat swab, rectal swab, stool, pus, OT specimens	
II.	Special tests – Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for mycobacterium, satellitism, CAMP test, catalase test and slide agglutination tests, and other as applicable for identification of bacteria upto species level	**9**
III.	Preparation of swabs/sterile tubes & bottles. Preparation of smear. Staining.: Gram & Ziehl -Neelsen staining. Identification of Culture media. Identification of instruments. Identification of common microbes.	**9**
IV	Performance of antimicrobial susceptibility testing by Kirby-Bauer disk diffusion method; estimation of Minimum inhibitory/Bactericidal concentrations by tube/plate dilution methods. Tests for drug susceptibility of Mycobacterium tuberculosis. Testing of disinfectants- Phenol coefficient and 'in use' tests.Quality control of media reagents etc. and validation of sterilization procedures. Aseptic practices in laboratory and safety precautions. Disposal of contaminated material like cultures	**9**
TOTAL		**36**

Text Books:

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 9th Edition, 2014.
2. HarshMohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 5th Edition, 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.

Reference Books:

1. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
2. William and Wilkins, Baltimore;1991 [1990 printing].
3. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- They can learn experientially about microorganism.
- Experiential learning on health camp conduction and detection of disorders as well as hands-on training.
- They can visit hospitals to get to learn about hospital setup and laboratory setup and function specially microbiology lab.

Semester -II

Detailed Syllabus

Subject: Diagnostic Instrumentation I		**Type of course: SEC**
Code: MLT242S211		**Level: 100**
Total Credit: 4	**Scheme of Evaluation: T**	**L-T-P-C: 0-0-8-4**

Course Objectives:

The course is with the objective of giving the students wholesome practical knowledge on Instrumentation.

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** Understand the basic principles and working mechanisms of common diagnostic instruments used in medical laboratories.	**BT 1**
CO 2	**Classify** he calibration, quality control, and maintenance procedures required for accurate and reliable instrument performance.	**BT 2**
CO 3	**Apply** basic skills to operate fundamental diagnostic devices such as spectrophotometers, centrifuges, microscopes, and hematology analyzers.	**BT 3**
CO 4	**Analyse** the limitations, sources of error, and troubleshooting methods for diagnostic instruments used in clinical testing.	**BT 4**

Course outcomes:

Modules	**Course Content**	**Periods**
I	Instruments in Clinical Labs Principles and Mechansims:	**22**

	Microscopy: Light microscope, Field Microscope, Fluorescent microscope, Phase contrast microscope, AFM, SCM, TEM,SEM, STM.	
II	Electrophoresis: Theory, different methods of electrophoresis for proteins and nucleic acids. Basic Principle of electrophoresis, Paperelectrophoresis,Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis	**22**
III	Chromatography, its principle, types and applications. Paper Chromatography. Thin layer chromatography. HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis. Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifugation	**22**
IV	Crystallography and X-Ray diffraction, Electron diffraction, Neutron diffraction. Radioisotope techniques: radiotracers GM Counter, Proportional and Scintillation counters, autoradiography, GCMS, LCMS, MALDI-ToF Radioisotopes Radioactivity, instruments for radio activity measurement, Spectrophotometer, Centrifugation	**22**
TOTAL		**88**

Reference Books:

1. Advances in Chromatography. Eli Grushka and NeluGrinberg (2007). Publisher: CRC: 1st edition.ISBN-10: 1420060252, ISBN-13: 978-1420060256, Volume 46.
2. Understanding NMR Spectroscopy. James Keeler (2005). Publisher: Wiley; 1st edition ISBN-10:0470017872, ISBN-13: 978-0470017876.
3. Physical Principles of Electron Microscopy: An Introduction to TEM, SEM, and AEM. Ray F.Egerton (2005). Publisher: Springer; 1st ed.. ISBN-10: 0387258000, ISBN-13: 978-0387258003.

Text books:

1. Fundamentals of Light Microscopy and Electronic Imaging. Douglas B. Murphy (2001). Publisher:Wiley-Liss; 1st edition ISBN-10: 047125391X, ISBN-13: 978-0471253914.
2. Principles and Techniques of Practical Biochemistry. Keith Wilson & John Walker(2000).Cambridge University Press.
3. Introduction to Spectroscopy. Donald L. Pavia, Gary M. Lampman, and George S. Kriz (2000).Publisher: Brooks Cole; 3rd edition. ISBN-10: 0030319617, ISBN-13: 978-0030319617

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**88 hrs**	**32 hrs**

Experiential learning activities may include:

- They can learn about instruments by visiting the lab
- They can visit hospitals to get to learn about hospital setup and laboratory setup and function.

Level: Semester -II

Detailed Syllabus

Name of the Subject: Introduction to Indian Knowledge System – II		**Type of Course: Interdisciplinary**
Paper Code: IKS992I201		**Course Level: 100**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 2-1-0-3**

Course Objectives

This Foundation course is designed to present an overall introduction to all the streams of IKS relevant to the UG program. It would enable students to explore the most fundamental ideas that have shaped Indian Knowledge Traditions over the centuries.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** traditional Indian knowledge traditions constituting Indian culture	**BT 1**
CO 2	**Summarize differences** between classical literature in Sanskrit and other Indian languages	**BT 2**
CO 3	**Compare** knowledge traditions originating in NE India	**BT 2**
CO 4	**Appreciate** the contribution of Indian Knowledge Systems to the world	**BT 3**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Indian Classical Literature** Indian Classical Literature: A Brief Introduction. Ancient Indian Spritual Poetics-*Kavya*: Contribution of Kalidasa **Diversity and Indian Culture:** - Diversity and Indian Culture -Indigenous Faith and Religion -Preservation of culture and indigenous knowledge **The Purpose of** Knowledge - Understanding Self-Awareness and Spirituality. -Indian concept and purpose of Knowledge and Education - Understanding Spirituality and Materialism: *Para* and *Apara Vidya*	**15**
II	**Methodology of Indian Knowledge System:** - *Shruti* and *Smriti* traditions. -Intoduction to *Shastras.* -Manuscriptology: The art and science of documenting knowledge. - Repositories of ancient manuscripts with special reference to the Norteast India. **Indian Architecture and Town Planning:** - Introduction ancient Indian architecture. - *Sthapatya-Veda*: An Introduction - Indigenous tools & techniques for town planning & Temple Architecture. Lothal, Mohan Jo Daro. - Temple Art: Lepakshi Temple, Jagannath Puri Temple, Konark Sun Temple. - Vernacular architecture of Assam: Special reference to Brahmaputra Valley	**15**
III	**Indian Agriculture:** - Agriculture: Significance in Human Civilization. - Sustainable Agriculture. - Historical significance of agriculture and sustainable farming in India. - Step Cultivation of India: Special reference to Northeast India. - Wet rice cultivation of Assam. **Indian Textiles:** What is Textile? - Tradition of cotton and silk textiles in India. - The historical contribution of textile and weaving to the Indian economy. - Varieties of textiles and dyes developed in different regions of India with special reference to Northeast India	**15**
IV	**Indian Polity and Economy:** - Understanding Kingdom and Chiefdom - Role of a king - The Indian idea of a well-organized polity and flourishing economy.	**15**

	- The *Chakravarti* System: Administrative System of Ancient Bharatvarsha. - Village administrative system: Northeast India. - *Arthashastra*: Brief synopsis **The outreach of Indian Knowledge System across Geographical Boundaries** - Indian Languages. - Scripts. - Linguistics. - Ayurveda. - Yoga and Meditation. - Textile - Decimal value place system-based arithmetic, Algebra and Astronomy	
TOTAL		**60**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
60	**00**	**30**

The experiential learning sessions may include:

- Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.
- Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.
- Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.
- Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems.
- Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students.

Text Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. (2022), Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning Private Ltd.
2. Mukul Chandra Bora, Foundations of Bharatiya Knowledge System. Khanna Book Publishing

Reference Book:

1. Baladev Upadhyaya, *Samskrta Śāstrom ka Itihās*, Chowkhambha, Varanasi, 2010.
2. D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., *A Concise History of Science in India*, 2nd Ed., Universities Press, Hyderabad, 2010.

3. Astāngahrdaya, Vol. I, *Sūtrasthāna and Śarīrasthāna*, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.
4. Dharampal, *The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century*, Dharampal Classics Series, Rashtrotthana Sahitya, Bengaluru, 2021.
5. J. K. Bajaj and M. D. Srinivas, *Indian Economy, and Polity in Eighteenth-century Chengalpattu*, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995, pp. 63-84.

Level: Semester II

Detailed Syllabus

Name of the Subject: Approaches to Verbal and Non-Verbal Communication		**Type of Course: AEC**
Paper Code: CEN982A201		**Course level:** 100
Total credits: 1	**Scheme of Evaluation:** T	**L-T-P-C:** 1-0-0-1

Course Objectives

To introduce the students to the various forms of technical communication and enhance their knowledge in the application of both verbal and non-verbal skills in communicative processes.

Course Outcomes:

SI No	Course Outcome	Blooms Taxonomy Level
CO 1	**List** the different types of technical communication, their characteristics, their advantages and disadvantages.	BT 1
CO 2	**Explain** the barriers to communication and ways to overcome them.	BT 2
CO 3	**Identify** the means to enhance conversation skills.	BT 3
CO 4	**Determine** the different types of non-verbal communication and their significance.	BT 4

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Technology Enabled Communication** Communicating about technical or specialized topics, Different forms of technology-enabled communication tools used in organisations Telephone, Teleconferencing, Fax, Email, Instant messaging , Blog, podcast, Videos, videoconferencing, social media	**4**

II	**Communication Barriers** Types of barriers: Semantic, Psychological, Organisational, Cultural, Physical, and Physiological. - Methods to overcome barriers to communication.	**4**
III	**Conversation skills/Verbal Communication** Conversation – Types of Conversation, Strategies for Effectiveness, Conversation Practice, Persuasive Functions in Conversation, Telephonic Conversation and Etiquette Dialogue Writing, Conversation Control.	**4**
IV	**Non-verbal Communication** Introduction; Body language- Personal Appearance, Postures, Gestures, Eye Contact, Facial expressions Paralinguistic Features-Rate, Pause, Volume, Pitch/Intonation/ Voice/ modulation Proxemics , Haptics, Artifactics, Chronemics	**4**
TOTAL		**16**

Text Books:

1. Rizvi, M. Ashraf. (2017). Effective Technical Communication. McGraw-Hill.

Reference Books :

1. Chaturvedi, P. D. and Chaturvedi, Mukesh. (2014). Business Communication.Pearson.
2. Raman, Meenakshi and Sharma, Sangeeta. (2011). Technical Communication: Principles and Practice (2nd Edition): Oxford University Press.

Level: Semester II

Detailed Syllabus

Name of the Subject: Behavioural Sciences -II **Type of Course: AEC**

Paper Code: BHS982A202 **Course level:** 100

Total credits: 1 **Scheme of Evaluation: T** **L-T-P-C:** 1-0-0-1

Course Outcomes:

CO Level	Course Outcome	Blooms Taxonomy Level
CO 1	**Develop** an elementary level of understanding of culture and its implications on personality of people	**BT 1**
CO 2	**Understand** the concept of leadership spirit and to know its impact on performance of employees	**BT 2**
CO 3	Understand and **apply** the concept of Motivation in real life	**BT 3**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I	**Culture and Personality** Culture: Definition, Effect, relation with Personality, Cultural Iceberg, Overview of Hofstede's Framework, Discussion of the four dimensions of Hofstede's Framework.	4
II	**Attitudes and Values** Attitude's definition: changing our own attitudes, Process of cognitive dissonance Types of Values, Value conflicts, Merging personal and Organisational values	4
III	**Motivation** Definition of motivation with example, Theories of Motivation (Maslow, McClelland's theory& Theory X and Y)	4
IV	**Leadership** Definition of leadership, Leadership continuum, types of leadership, Importance of Leadership, New age leaderships: Transformational & transactional Leadership, Leaders as role models.	4
TOTAL		**16**

Text books

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc
- Organizational Behaviour by Kavita Singh (Vikas publishers, 3rd Edition).

SYLLABUS (3rdSEMESTER)

Level: Semester -III

Detailed Syllabus

Name of the Subject: Immunology and Serology (Theory +Lab)		**Type of Course: Major**
Paper Code: MLT242M301/ MLT242M311		**Course Level: 200**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding immune system and serological techniques.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic knowledge on immunity and explain the immunological process at molecular and cellular level.	**BT 1**
CO 2	**Explain** the basic concepts of antigen-antibody interactions and the immunological basis of serological tests.	**BT 2**
CO 3	**Apply** the use of serological techniques in diagnosis	**BT 3**
CO 4	**Analyse** and differentiate between various serological techniques	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Immunology:** Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response, Cell and organs of immune system, Phagocytosis. **Antigens and Antibodies:** Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens	**16**
II	**Antibodies:** Historical perspective of antibody structure; structure, function, and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype. Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody. Immunological disorders: primary and secondary immunodeficiency, SCID. Interleukins, MHC-I, MHC-II and other	**16**

	types.	
III	Slide agglutination and tube agglutination Widal tests, complement fixation test principle, Immunoflourescence test. Principle and interpretation of various, immunological tests done by the Laboratory.Pregnancy test, (including the historical background and Bioassays). A S O, CRP, RP, ANF and autoimmune disorder, Widal, TPI, RPCF, FLA, ABS).	**16**
IV	EIA and RIA – Principle; Viral Hepatitis and the markers. Syphilitic Serology – Kahn, VDRL, RPR. Indirect passive agglutination a/ using RBC as carriers (Coated RBC) Pregnancy tests HBs Ag. b/ Latex coated particles fixation, Bentonite, Rheumatoid factor; Pregnancy latest (Gravindex) pregtel ASL and CRPA.	**16**
TOTAL		**64**

Title of the Paper: Immunology and serology (Lab) **Paper code: MLT242M311**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Diagnostic tests by kit method: WIDAL,VDRL,RPR,ASO,CRP,TPHA,HCG,	**18**
II.	Latex agglutination test, Pregnancy test HIV, tridot, HbSAg	**18**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Students can have exposure to labs and identify different microorganisms in microscope.
- They can visit hospitals to get to learn about microbiology
- Students making a model or chart explaining on HIV virus and its impact on our society

Texts:

1. Textbook of Microbiology, Ananthanarayann, Paniker, Arti Kapil,9thedition, universities press
2. Laboratory immunology & Serology – Neville J. Bryant.
3. C.P.Baveja, Textbook of microbiology,6thedition,Arya Publications
4.

Reference Book:

1. TEXTBOOK OF IMMUNOLOGY by Dr. Ajoy Paul
2. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication
3. Textbook of Medical Virology By Baijayantimala Mishra

Level: Semester -III

Detailed Syllabus

Name of the Subject: Advanced Clinical Biochemistry (Theory +Lab)		**Type of Course: Major**
Paper Code: MLT242M302/ MLT242M312		**Course Level: 200**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding biochemistry related to metabolisms and different enzymes.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic knowledge on enzymes, its classification and their mode of action.	**BT 1**
CO 2	**Explain** the relation between the different types of metabolic pathway and its relation to the other.	**BT 2**
CO 3	**Apply** the knowledge of the key metabolic pathway involved in energy production, storage and utilization in living organisms.	**BT 3**
CO 4	**Analyse** the biological charts to understand the metabolic pathways of protein, carbohydrates and fats.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Metabolism of carbohydrates:** Glycogenesis, Glycogenolysis, Clinical orientation of glycogen, Glycolysis, Citric acid cycle, energetic of citric acid cycle, Glyconeogenesis, Regulation of glucose metabolism, Metabolism of Fructose, Metabolism of Galactose, Regulation of blood glucose concentration.	**16**
II	**Metabolism of Proteins:** General pathway of protein metabolism, Nitrogen metabolism, catabolism of proteins - Transamination, Oxidative Deamination, transdeamination. Synthesis of urea, metabolism of individual amino acids overview, Structural orientation of protein, Protein synthesis: Translation, Transcription	**16**
III	**Metabolism of Lipids** Role of liver in fat metabolism, B Oxidation of fatty acid, Biosynthesis of lipids, Prostaglandin, Cholesterol metabolism, formation of bile acids, plasma lipoproteins,	**16**
IV	Integration of metabolic pathways of carbohydrate, proteins, and fats. Formation of bile pigments, catabolism of heme. Enzymes: Definition, classification, co-enzyme, iso-enzyme, mechanism of action, factors affecting enzyme activity.	**16**
	TOTAL	**64**

Title of the Paper: Advanced Clinicall Biochemistry (Lab) Paper code: MLT242M312

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Liver function tests – Total Bilirubin, direct and Indirect Bilirubin, Urinary Bile salt, Urinary Bile pigments, Urinary Urobilinogen, Total Protein, Albumin, SGOT, SGPT.	**12**
II	Renal Function Test – Estimation of urea, Uric acid and Creatinine, Urine Examination R/E Protein Estimation.	**12**
III	Gastric Function Test – Examination of resting Content Quality control in Biochemistry laboratory.	**12**
	TOTAL	**36**

CREDIT DISTRIBUTION

LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

1. Students can make model of different metabolic pathway.
2. Students can visit hospitals and have exposure to biochemistry labs
3. With the help of chart they can explain the functions of different enzymes.

Textbook:

1. 1.Leininger , Principles of Biochemistry. 7th Edition, 2017.
2. 2.Robert K. Murry, Daryl K. Granner and Victor W. Rodwell., Harper's Biochemistry. 30th Edition, 2015
3. 3.D. Satyanarayana and Chakrapani, Biochemistry.5th Edition, 2017.

Reference Book:

1. Robert Horton H, Laurence A Moran, Gray Scrimgeour K. Principles of Biochemistry, 4th Edition, 2006, Pearsarson Publisher. ISBN-13: 978-0321707338
2. Conn and Stumpf, Outlines of Biochemistry, 5th Edition, 2006.

Level: Semester -III

Detailed Syllabus

Name of the Subject: Basic Haematology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M303/ MLT242M313		**Course Level: 200**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Haematology

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic knowledge on the blood cells, their formation, and the lab investigations.	**BT 1**
CO 2	**Classify** the different disorders of Red blood cell.	**BT 2**
CO 3	**Organize** the knowledge on formation of WBC, platelets, methods of counting and clinical importance.	**BT 3**
CO 4	**Analyse** the importance of haemostasis, coagulation and preparation of bone marrow smear and process and types of staining.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Introduction of Haematology:** Blood – formation, composition, Method of collections, Preservation of blood for routine examination and Anticoagulant, **Red Blood Cells/ Erythrocytes:** Formation, Morphology, Functions, Count methods and its clinical importance, Haemoglobin, Reticulocyte, PCV, ESR	**16**
II	**Anaemia**: Definition, Morphology & Etiology classification, Microcytic Hypochromic anaemia – Causes, Types, Lab investigation, Laboratory pictures, Clinical importance. Normocytic Hypochromic anaemia and Diamorphicanaemia. ,other types of anaemia in details - sickle cell anemia, Thalassaemia.	**16**
III	**White Blood Cells (WBC):** Formations, Functions, life span, morphology, Types, Methods of counting, total WBC and differential counts (preparation of smears), Leukaemia and its classification.	**16**
IV	**Platelets:** Formation, Morphology, Functions, Method of counting, normal & abnormal counts with clinical importance **Haemostasis:** Haemostasis in detail, Haemophilia – Definition, Types & Investigation, Clinical importance	**16**
TOTAL		**64**

Title of the Paper: Basic Haematology (Lab) **Paper code: MLT242M313**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods

I.	• Study of Microscopes • Collection of blood • Study of instruments and glassware's	**12**
II	• Preparation of blood thin film and staining and study of RBC morphology • Preparation of blood thick film and staining and study of blood parasite	**12**
III	• BT,CT • Haemoglobin estimation by various methods, • ESR estimation	**12**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Students can draw the chart on Erythropoiesis.
- Students can explain the different lab investigations for blood with the help of chart.
- Students can show a diagrammatic representation of hemostasis.

Text Books:

1. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
2. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house
3. Textbook of Medical laboratory Technology , RamnikSood, Jaypee publishers

References:

1. Dacie and lewis practical Haematology, Barbara J Bain, Imedla Bates, Mike A Laffan,12th edition, Elsevier publications
2. Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publishers

Level: Semester -III

Detailed Syllabus

Subject: Clinical Pathology		**Type of course: Major**
Subject Code: MLT242M304		**Course Level: 200**
Total credits: 3	**Scheme of Evaluation:T**	**L- T-P-C: 3-0-0-3**

Course Objectives:

The course with an objective to give the students a wholesome practical knowledge on collecting different biological specimen and its role in analyzing different pathological disorders, on performing different biochemical and microscopic examination of urine and the different methods to perform ABO blood grouping.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Name** the biological specimen commonly collected in clinical laboratory.	**BT 1**
CO 2	**Explain** the clinical importance of 24 hours urine examination for proteins.	**BT 2**
CO 3	**Apply** the knowledge of the principle of blood grouping and perform both forward and reverse grouping.	**BT 3**
CO 4	**Analyze** the physical and microscopic examination of the various biological specimen	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I	**CLINICAL PATHOLOGY** Urine collection for Routine examination. Midstream Urine Collection 24 hrs. Urine examination for proteins. Urine R/E- Physical Examination Biochemical Examination Microscopic Examination in detail.	**16**
II	Peripheral Blood examination -Physical, Chemical, Cell count –	**16**

	DLC/TLC, Cerebrospinal Fluid (CSF) examination: Physical, Chemical, Cell cou DLC/TLC	
III	Sputum analysis: Physical Examination, Chemical examination, Microscopy examination. Acid-Fast Bacilli (AFB) Staining in details Stool analysis in detail.	**16**
IV	Preparation of Blood cells for ABO grouping, Preparation of Serum Cells for reverse grouping, Blood grouping Forward grouping - Moist Chamber Slide method and tube method Reverse Grouping – Moist Chamber Slide method and tube metho Cross matching, Donor Screening	**16**
TOTAL		**64**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**00**	**26**

Experiential learning activities may include:

- The students know about the specimen collection in the clinical laboratory.
- They can have exponential learning as regards ABO and Rh blood group types and their disorders as well as hemoglobinopathies.
- Experiential learning on health camp conduction and detection of disorders as well as hands on training.

Suggested Books:

1. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
2. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house
3. Textbook of Medical laboratory Technology, RamnikSood, Jaypee publishers

References:

1. Dacie and lewis practical Haematology, Barbara J Bain, Imedla Bates, Mike A Laffan,12th edition, Elsevier publications
2. Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publishers

Semester -III

Detailed Syllabus

Name of the Subject: Fundamentals of MLT		**Type of Course: Interdisciplinary**
Paper Code: *MLT242I301*		**Course Level: 200**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives:

The course is with the objective of giving the students wholesome knowledge on Fundamentals of MLT.

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic principles, roles, code and conduct of Medical Laboratory Technology.	**BT 1**
CO 2	**Illustrate** the different instruments used in the laboratory, with its uses, care and maintenance.	**BT 2**
CO 3	**Apply** the basic knowledge in principles, uses, care and maintenance of different types of microscope.	**BT 3**
CO 4	**Analyse** the different types of specimen in laboratory and preparation of different types of solutions.	**BT 4**

Course outcomes:

Modules	Course Content	Periods
I	Basic laboratory principles Code of conduct of medical laboratory personnel. Organization of clinical laboratory and role of medical laboratory technician Safety measures.	**16**
II	Common glasswares in clinical laboratory. Cleaning, care and maintenance of glasswares. Calibration of pipettes and other volumetric apparatus. Laboratory instruments.	**16**
III	Microscopes-Principles, parts, use, care and maintenance of Light microscope, Electron microscope, Fluorescent microscope, Dark ground microscope, Phase contrast microscope etc.	**16**
IV	General approach to specimen collection, transport and disposal. Anticoagulants- E.D.T.A, sodium citrate. Sodium Fluoride. Preparation of solution: Normal solution, Buffer solution, Percent solution, normal saline, Molar solution. Preparation of Normal saline	**16**
TOTAL		**64**

Text Books:

1. Clinical Pathology, Haematology and Blood Banking by Nanda Maheshwari

2. The Fundamentals of Medical Laboratory Technology eBook by Siddharth G. Maske

Reference Books:

1. Concise book of Medical Laboratory Technology (Methods and Interpretations) by Ramnik Sood.
2. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64 hrs	**00**	**26 hrs**

Experiential learning activities may include:

- They can visit the laboratory and identify different glasswares,
- They can visit the laboratory and learn how to use microscopes and blood specimens.

Level: Semester III

Detailed Syllabus

Name of the Subject: : Fundamentals of Business Communication **Type of Course: AEC**

Paper Code: CEN982A301 **Course Level: 200**

Total credits: 1 **Scheme of Evaluation: T** **L-T-P-C:** 1-0-0-1

Course Objectives

The aim if the course is to develop essential business communication skills, including effective writing, speaking, and interpersonal communication, to enhance professional interactions, collaboration, and successful communication strategies within diverse corporate environments.

Course Outcomes:

CO Level	Course Outcome	Blooms Taxonomy Level
CO 1	**Define** and list business documents using appropriate formats and styles, demonstrating proficiency in written communication for various business contexts.	**BT 1**

CO 2	**Demonstrate** confident verbal communication skills through persuasive presentations, active listening, and clear articulation to engage and influence diverse stakeholders.	**BT 2**
CO 3	**Apply** effective interpersonal communication strategies, including conflict resolution and active teamwork, to foster positive relationships and contribute to successful organizational communication dynamics	**BT 3**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Business Communication: Spoken and Written** • The Role of Business Communication • Classification and Purpose of Business Communication • The Importance of Communication in Management • Communication Training for Managers • Communication Structures in Organizations • Information to be Communicated at the Workplace • Writing Business Letters, Notice, Agenda and Minutes	**5**
II	**Negotiation Skills in Business Communication** • The Nature and Need for Negotiation o Situations requiring and not requiring negotiations • Factors Affecting Negotiation o Location, Timing, Subjective Factors • Stages in the Negotiation Process o Preparation, Negotiation, Implementation - • Negotiation Strategies	**5**
III	**Ethics in Business Communication** • Ethical Communication • Values, Ethics and Communication • Ethical Dilemmas Facing Managers • A Strategic Approach to Business Ethics • Ethical Communication on Internet • Ethics in Advertising	**5**
IV	**Business Etiquettes and Professionalism** • Introduction to Business Etiquette • Interview Etiquette • Social Etiquette • Workplace Etiquette - • Netiquette	**5**

Text Books:

1. Business Communication by Shalini Verma

Reference Books:

1. Business Communication by PD Chaturvedi and Mukesh Chaturvedi
2. Technical Communication by Meenakshi Raman and Sangeeta Sharma

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
15 hrs	**-**	10 hours - Group Discussion - Presentation - Quiz - Case Study

Level: Semester III

Detailed Syllabus

Name of the Subject: : Behavioural Sciences - III		**Type of Course: AEC**
Paper Code: BHS982A302		**Course Level: 200**
Total credits: 1	**Scheme of Evaluation: T**	**L-T-P-C:** 1-0-0-1

Course Objectives

To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations .To enable the students to understand the process of problem solving and creative thinking.

Course Outcomes:

CO Levels	Course Outcome	Blooms Taxonomy Level
CO 1	Understand the process of problem solving and creative thinking.	**BT 1**
CO 2	Develop and enhance of skills required for decision-making.	**BT 2**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Problem Solving Process** Defining problem, the process of problem solving, Barriers to problem solving(Perception, Expression, Emotions, Intellect ,surrounding environment)	**4**
II	**Thinking as a tool for Problem Solving** What is thinking: The Mind/Brain/Behaviour Critical Thinking and Learning: -Making Predictions and Reasoning. -Memory and Critical Thinking. - Emotions and Critical Thinking.	**4**
III	**Creative Thinking** - Definition and meaning of creativity , - The nature of creative thinking :Convergent and Divergent thinking, - Idea generation and evaluation (Brain Storming) - Image generation and evaluation. - The six-phase model of Creative Thinking: ICEDIP model	**4**
IV	**Building Emotional Competence** Emotional Intelligence – Meaning, components, Importance and Relevance Positive and Negative emotions Healthy and Unhealthy expression of emotions	**4**
TOTAL		**16**

Text books

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

SYLLABUS (4th SEMESTER)

Level: Semester -IV

Detailed Syllabus

Name of the Subject: Advanced Haematology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M401/ MLT242M411		**Course Level: 200**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to upgrade the students to gain knowledge regarding Haematology in more details

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic knowledge on the blood cells, their formation, and the lab investigations.	**BT 1**
CO 2	**Classify** the different disorders of Red blood cell.	**BT 2**
CO 3	**Organize** the knowledge on formation of WBC, platelets, methods of counting and clinical importance.	**BT 3**
CO 4	**Analyse** the importance of haemostasis, coagulation and preparation of bone marrow smear and process and types of staining.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	Haematopoiesis: Origin, development, function and fate of blood cells. Erythropoiesis- Origin, development of RBCs, Disorders of RBC: Anaemia. Different types of Anemia in details	**16**
II	Disorders of white blood cells- Leucocytosis, Leukopenia, Leukaemias Classification- (French American British- FAB classification) Lab investigation, Chronic myeloid leukaemia, Chronic Lymphocytic Leukaemia.	**16**

III	Plasma cell disorder- classification, Plasma cell myeloma- definition, clinical features, Haemorrhagic disorders, vascular disorders, platelet disorder, coagulation disorders	**16**
IV	**Bone marrow:** Method of preparation of bone marrow smears, Different types of staining of bone marrow smear. **Coagulation:** Definition, Principle & mechanism of coagulation, Factors of coagulation, In brief coagulation profile.	**16**
TOTAL		**64**

Title of the Paper: Advanced Haematology (Lab) **Paper code: MLT242M411**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	• PCV estimation • Total RBC counts, Total WBC counts • ,PTT and APTT	**18**
III	• Preparation of blood thin film and staining and study of Differential leucocyte counts • Absolute Platelet count • Reticulocyte count • Eosinophil count	**18**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Students can draw the chart on Erythropoiesis.
- Students can explain the different lab investigations for blood with the help of chart.
- Students can show a diagrammatic representation of hemostasis.

Text Books:

4. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers

5. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house
6. Textbook of Medical laboratory Technology , RamnikSood, Jaypee publishers

References:

3. Dacie and lewis practical Haematology, Barbara J Bain, Imedla Bates, Mike A Laffan,12th edition, Elsevier publications
4. Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publishers

Level: Semester -IV

Detailed Syllabus

Name of the Subject: Histopathology and Cytopathology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M402/ MLT242M412		**Course Level: 200**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding histopathology and cytopathology

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** normal histological structures and identify pathological changes such as cellular abnormalities	**BT 1**
CO 2	**Classify** the different types of microtomes, methods of staining tissues, mounting etc.	**BT 2**
CO 3	**Apply** the concept of cellular specimen collection, demonstrating the ability to diagnose by identify normal and abnormal cell morphology**.**	**BT 3**
CO 4	**Analyze** the skills to accurately prepare cell block, staining procedure based on different types of stains and skills for lab establishment.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Introduction of histopathology, laboratory organization, care & maintenance of equipment's used in histotechnology lab, Basic concepts of fixation and various types of fixative used in histopathology. Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, Decalcification, decalcification methods, Embedding media, its type and properties	**16**
II	Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Cryostat, frozen sections of fresh, fixed and unfixed tissue, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, metachromatic dyes, types of hematoxylin, Hematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages.	**16**
III	Definition of cytology, Cells & tissues, Normal tissues, Classification of cytology- Exfoliative and interventional cytology, Collection of specimens from female genital tract specimen for routine screening, **Urinary cytology**: Collection of `urinary tract specimens, Diagnostic utility of urinary cytology, Progressive changes of the cells.	**16**
IV	Cell block preparation, Cytological fixative and mailing Definition, Types/classification, Aims & object, Materials for establishments of cytological lab, Staining: R/E stain types-Methods, Maintenance, Preparation of stain, Pap's stain, Special stains- MGG, PAS, ZN, Mucicarmineetc, Mounting and Labelling, Establishments of lab-Manpower, Space, Ventilation, Light, Water, working benches, Room arrangements, Reception of specimens, Instruments required.	**16**
TOTAL		**64**

Detailed syllabus:

Title of the Paper: Histopathology and Cytopathology (Lab) Paper code: MLT242M412

Modules	Topics (if applicable) & Course Contents	Periods
I.	Labelling of specimen, Filling of forms, Receiving and labelling of sample and maintenance of register, Slide demonstration of different types of cells, Common instruments for histopathology, Fixative preparation, Preparations of graded alcohols, grossing, Tissue Processing, Decalcification Preparation of blocking and section cutting, staining, mounting and labelling. Staining- Haematoxylene& Eosin stain, PAS stain, Oil Red O'/ Sudan Black stain,	**18**
II	Receiving of Sample, Labelling and maintanence of registers Preparation of Exfoliative cytological smears Fixation – types and methods, Preparation of smears in interventional cytology, Fixation and stains, . Staining R/E: Preparations of stains, Methods – MGG & PAPs, Mounting, Labelling, Record keeping of reports and blocks, Lab Safety and Quality control.	**18**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Students can draw a chart on systematic procedure of tissue processing along with diagram.
- Students can draw a chart on systemetic staining procedure with colourfull diagrams.
- Students can demonstrate on the working of microtome

Texts Books:-

1. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
2. Bancroft's theory and practice of Histological techniques by S. Kim Suvarna, Christopher Layton, John D. Bancroft, 7th edition, Churchill Livingstone publishers
3. General and Systemic Pathology, James underwood, Simon Cross,5th edition, Elsevier

References:

1. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house

2. Histotechnology, A self-instructional text by Freida L. Carson,1stedition, Lippincott Williams publishers

Semester -IV

Detailed Syllabus

Name of the Subject: Systemic bacteriology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M403/ MLT242M413		**Course Level: 200**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Bacteriology

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the basic knowledge on bacteria and its different classification.	**BT 1**
CO 2	**Explain** bacteria based on taxonomy, staining characteristics, and biochemical properties.	**BT 2**
CO 3	**Identify** different types of bacteria and the different methods of laboratory diagnosis.	**BT 3**
CO 4	**Analyse** standard aseptic techniques and perform bacterial cultivation using various culture media.	**BT 4** **BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**BACTERIOLOGY** Systemic bacteriology Study of - Staphylococcus, Streptococcus, Pneumococcus, Cornybacteriumdiptheriae, Mycobaterium, E. coli, Klebsiella, Salmonella, Pseudomonas, Vibrio, Neisseria	**16**
II	Systemic study of morphologic biochemical and antigenic characters, pathogenesis , Laboratory diagnosis of Gram Positive Bacilli- Corynebacterium, Mycobacterium, Actinomycetes Listeria,	**16**

	Bacillus, Clostridia.	
III	Systemic study of morphologic biochemical and antigenic characters, pathogenesis , Laboratory diagnosis of Gram Negative Bacilli- Enterobacteriaceae, Pseudomonas Alcaligenes, Vibrio, Aeromonas, Plesiomonas, Campylobacter, Bacteroides,	**16**
IV	Fusobacterium, Brucella, Haemophilus, Bordetella, Pasteurella, Francisella Miscellaneous Bacteria - Spirochaetes, Chlamydia, Rickettsia, Mycoplasma, L forms, etc.	**16**
TOTAL		**64**

Title of the Paper: Systemic bacteriology (Lab) **Paper code: MLT242M413**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Culture Techniques Composition of culture media Preparation of media	**18**
III	Identification of media & their uses Culture methods & identification of common bacteria on media. Antibiotic sensitivity testing.	**18**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Can identify different microorganism under the microscope.
- Make a chart on different classification of bacteria with examples

Texts:

1. Medical Microbiology by R. Cruickshanketal, vol.I ELBS
2. Medical Laboratory Manual for Tropical Countries, Volume II : Microbiology, by Monica Cheesbrough ELBS
3. Text book of practical Microbiology by S.C.Parija

Reference Book:

1. Mackie and McCartne; Practical Medical Microbiology Volume 1 & 2, 14th edition (2007), Elsevier.
2. Textbook of Microbiology, Ananthanarayann, Paniker, Arti Kapil,9thedition, universities press
3. C.P.Baveja, Textbook of microbiology,6thedition,Arya Publications

Level: Semester -IV

Detailed Syllabus

Name of the Subject: Applied Pathology	**Type of Course: Major**
Paper Code: MLT242M404	**Course Level: 200**
Total credits: 3 **Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Applied Pathology **Course Outcomes:**

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the basic concepts of disease processes and cell injury.	**BT 1**
CO 2	**Explain** pathological conditions affecting the musculoskeletal system.	**BT 2**

CO 3	**Identify** major dermatological and autoimmune skin conditions	**BT 3**
CO 4	**Analyse** pathological changes in the central nervous and respiratory systems	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Introduction**: Concepts of diseases, classification of lesions **Cell injury:** Reversible cell injury-types, sequential changes, cellular swellings, vacualation, hyaline changes, mucoid changes. Irreversible cell injury-types of necrosis and gangrene, Autolysis.	**16**
II	**Pathology: Bone and Joints**: Autoimmune diseases, septic arthritis, Osteomyelitis, osteomalacia, Gout, Rickets • **Skin**- melanin pigment disorder, vitiligo, Alopecia, skin biopsy, leprosy, SLE, Scleroderma and Psoriasis • **Central nervous system**: CNS infections, vascular disorders **Respiratory system:** COPD, pneumonia, pleuritis, lung collapse-atelectasis	**16**
III	**Inflammation and repair**- Acute inflammation-features, causes, vascular and cellular events, inflammatory cells and mediators Chronic inflammation-causes, types, classification, nonspecific and granulomatous with examples.	**16**
IV	**Repair**, wound healing by primary and secondary union, factors promoting and delaying the process. Healing in specific site including bone healing. Haemorrhage, shock-pathogenesis,types, morphologic changes embolism and thrombosis- formation, fate and effects. • **Pathology: Rheumatoid Arthritis** – epidemiology, causes, sites, pathophysiology, clinical features, diagnosis • **Haematology**- bleeding and coagulation disorder, lymphoid and myeloid neoplasms • **Hepatic diseases**- Cirrhosis-emphasis to systemic effects of portal Hypertension. • Congenital heart disease	**16**

TOTAL	64

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**88**	**26**

Experiential learning activities may include:

- Students can identify the different pathological cells under microscope.
- Students can apply theoretical knowledge to clinical scenarios.

Texts:

1. Robbins & Cotran Pathologic Basis of Disease E-Book. By Vinay Kumar, Abul K. Abbas, Nelson Fausto, Jon C
2. Pathology for Paramedical Students and Allied Health Sciences ; Author: Ramnik Sood

Reference Book:

1. Textbook of Pathology. by Harsh Mohan
2. Textbook of Pathology for Allied Health Sciences by Ramadas Nayak

Level: Semester -IV

Detailed Syllabus

Subject: Biomedical Waste management		**Type of course: Minor**
Code: MLT242M405		**Level: 200**
Total Credit: 3	**Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives:

The course is with the objective of giving the students wholesome practical knowledge on biomedical waste management.

On successful completion of the course the students will be able to:

SI. No	Course Outcome	Blooms Taxonomy Level
CO 1	**Recall** the Bio-medical waste, Concepts and Perceptions Waste Generation, Segregation Disposal	BT 1
CO 2	**Classify** the different Policies and Perspectives of BMW Management	BT 2
CO 3	**Apply** a Basic Policies and Perspectives of BMW Management	BT 3
CO 4	**Analyse** the Criteria for selecting appropriate Medical Waste Technologies	BT 4

Course outcomes:

Modules	Course Content	Periods
I	Bio-medical waste – Concepts and Perceptions Waste Generation Segregation Disposal	16
II	Planning and Objectives of BMW Management Survey Policies of BMW Management Perspectives of BMW Management	16
III	Record Keeping Management of Bio-medical Waste Technologies for Treatment for BMW Criteria for selecting appropriate Medical Waste Technologies	16
IV	Training, Occupational Safety and Health Issues Legal Aspects and Environment Concern Implementation of Action Plan Approaches to Common Regional facility	16
TOTAL		64

Reference Books:

1. The Book of Hospital Waste Management: Dr. D.B. Acharya & Dr. Meeta Singh (Minerva Press, New Delhi)

2. Hospital Waste Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi)

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING

64 hrs	**00**	**26 hrs**

Experiential learning activities may include:

- They can learn about BMW Management
- They can visit hospitals to get to learn about hospital setup and laboratory setup and function.

Level: Semester IV

Detailed Syllabus

Name of the Subject: Employability and Communication		**Type of Course: AEC**
Paper Code: CEN982A401		**Course level:** 200
Total credits: 1	**Scheme of Evaluation: T**	**L-T-P-C:** 1-0-0-1

Course Objectives

This course is designed to enhance employability and maximize the students' potential by introducing them to the principles that determine personal and professional success, thereby helping them acquire the skills needed to apply these principles in their lives and careers.

Course Outcomes:

CO Level	Course Outcome	Blooms Taxonomy Level
CO 1	**Demonstrate** understanding the importance of verbal and non-verbal skills while delivering an effective presentation.	**BT 1**
CO 2	**Develop** professional documents to meet the objectives of the workplace	**BT 2**
CO 3	**Identify** different life skills and internet competencies required in personal and professional life.	**BT 3**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Presentation Skills** Importance of presentation skills, Essential characteristics of a good presentation, Stages of a presentation, Visual aids in presentation,	**5**

	Effective delivery of a presentation	
II	**Business Writing** Report writing: Importance of reports, Types of reports, Format of reports, Structure of formal reports Proposal writing: Importance of proposal, Types of proposal, structure of formal proposals Technical articles: Types and structure	**5**
III	**Preparing for jobs** Employment Communication and its Importance, Knowing the four step employment process, writing resumes, Guidelines for a good resume, Writing cover letters. Interviews: Types of interview, what does a job interview assess, strategies of success at interviews, participating in group discussions.	**5**
IV	**Digital Literacy and Life Skills** **Digital literacy**: Digital skills for the '21st century', College students and technology, information management using Webspace, Dropbox, directory, and folder renaming conventions. Social Media Technology and Safety, Web 2.0. **Life Skills:** Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problemsolving, Effective communication, interpersonal relationship, coping with stress, coping with emotion. Application of life skills: opening and operating bank accounts, applying for pan, passport, online bill payments, ticket booking, gas booking	**5**

Text Books:

1. Business Communication by Shalini Verma References:

References Books:

1. Technical Communication by Meenakshi Raman and Sangeeta Sharma

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
15 hrs	**-**	10 hours - Movie/ Documentary - screening - Field visits - Peer teaching - Seminars - Library visits

Level: Semester IV

Detailed Syllabus

Name of the Subject: Behavioural Sciences – IV		**Type of Course: AEC**
Paper Code: BHS982A402		**Course level:** 200
Total credits: 1	**Scheme of Evaluation: T**	**L-T-P-C:** 1-0-0-1

Course Objectives

To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations.

Course Outcomes:

CO Level	Course Outcome	Blooms Taxonomy Level
CO 1	Understand the importance of individual differences	**BT 1**
CO 2	Develop a better understanding of self in relation to society and nation	**BT 2**
CO 3	Facilitation for a meaningful existence and adjustment in society	**BT 3**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Managing Personal Effectiveness** Setting goals to maintain focus, Dimensions of personal effectiveness (self disclosure, openness to feedback and perceptiveness), Integration of personal and organizational vision for effectiveness, A healthy balance of work and play, Defining Criticism: Types of Criticism, Destructive vs Constructive Criticism, Handling criticism and interruptions.	**4**
II	**Positive Personal Growth** Understanding & Developing positive emotions, Positive approach towards	

	future, Impact of positive thinking, Importance of discipline and hard work, Integrity and accountability, Importance of ethics in achieving personal growth.	**4**
III	**Handling Diversity** Defining Diversity, Affirmation Action and Managing Diversity, Increasing Diversity in Work Force, Barriers and Challenges in Managing Diversity.	**4**
IV	**Developing Negotiation Skills** Meaning and Negotiation approaches (Traditional and Contemporary) Process and strategies of negotiations. Negotiation and interpersonal communication. Rapport Building – NLP.	**4**
TOTAL		**16**

Text books

- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company
- Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

SYLLABUS (5th SEMESTER)

Semester -V

Detailed Syllabus

Name of the Subject: Mycology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M501/ MLT242M511		**Course Level: 300**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Medical Mycology.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** basic facts and definitions related to including the names and features of various fungi	**BT 1**
CO 2	**Explain** the importance of fungi in both the environment and human health, explaining their biological roles and impact on individuals**.**	**BT 2**
CO 3	**Organize** the practical skills to work with samples, employing methods like staining, culturing, and microscopy to identify fungi and parasites in real-world scenarios.	**BT 3**
CO 4	**Analyse** and evaluate clinical data and case studies, interpreting symptoms and laboratory results to diagnose infections and suggest effective treatments.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	Introduction to Mycology, Characteristics of fungi. Taxonomical & morphological classification of fungi. Nutrition and cultivation of fungi. Reproduction and sporulation of fungi. Types & structure of fungal spores. Formation of fungal spore. Classification of fungal diseases: superficial, subcutaneous & systemic & opportunistic mycoses	**16**

II	Morphological, cultural characteristics of common fungal laboratory contaminants. Preservation of fungal cultures.Superficial Mycoses (morphology, life cycle, culture characteristics, pathogenesis, infection with clinical feature and laboratory diagnosis): Dermatophytes, Pityriasis versicolor (Tinea versicolor), Tinea nigra, Piedra. Subcutaneous Mycoses (morphology, life cycle culture characteristics, pathogenesis, disease with clinical feature and laboratory diagnosis): Actinomycetes & filamentous fungi (causative agent of mycetoma), Dematiaceae family fungi (causative agent of chromomycosis), Sporothrix schenckii (causative agent of sporotricosis), Rhinosporidium seeberi (causative agent of Rhinosporidiosis).	**16**
III	Systemic Mycoses (morphology, life cycle culture characteristics, pathogenesis, disease with clinical feature and laboratory diagnosis): Histoplasma capsulatum (causative agent of Histoplasmosis), Blastomyces dermatititis (causative agent of Blastomycoses), Paracoccidioides brasiliensis (causative agent of Paracoccidioidomycosis), Coccidioides immitis (causative agent of Coccidioidomycosis), Cyptococcus neoformance (causative agent of Cyptococcosis)	**16**
IV	Common laboratory diagnosis of mycoses: Direct microscopy – KOH preparation, gram staining, Lacto phenol cotton blue, Indian ink preparation. Culture methods for fungus - colony characteristics on special media. Examination of tissues section for fungal infections. Processing of clinical samples for diagnosis of fungal infections: Skin, nail, hair, pus, sputum, CSF and other body fluids. Routine myco-serological tests.	**16**
TOTAL		**64**

Title of the Paper: Mycology (Lab) **Paper code: MLT242M511**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Media and stains preparation for Mycology, Diagnostic methods in Mycotic infections, Study of Growth characteristics, Microscopic examination and identification of Medically important fungi,	**18**
II	Collection, transportation and processing of specimens for mycological examination, Slide culture technique, Germ tube test for yeast identification, Serological tests in Mycology.	**18**
TOTAL		**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

1. Exposure to microbiology samples in the lab
2. Perform different experiment on detection of fungus

Text Books:

1.Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2.Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3.Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.
4. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
5. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.
5. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester -V

Detailed Syllabus

Name of the Subject: Diagnostic Molecular Biology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M502/ MLT242M512		**Course Level: 300**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Diagnostic Molecular Biology.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the fundamental principles of molecular biology techniques used in diagnostics, such as PCR, sequencing, and gene expression analysis.	**BT 1**
CO 2	**Explain** the role of molecular biology in the detection and diagnosis of infectious diseases and genetic disorders.	**BT 2**
CO 3	**Apply** perform and interpret basic molecular diagnostic tests, including PCR amplification and radioisotopes application for clinical samples.	**BT 3**
CO 4	**Analyze t**he effectiveness, sensitivity, and limitations of various molecular diagnostic techniques in different clinical settings.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Nucleic Acids, DNA, RNA, composition, structure, types, denaturation andrenaturation of DNA, chemistry of DNA synthesis, general principles of replication,enzyme involved in DNA replication,– DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins	**16**
II	Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors Introduction of translation	**16**
III	Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT PCR, reverse transcriptase PCR, Nested PCRBlotting techniques, southern blotting and Western blotting . Introduction to chromosomes, its structure and disorder, Karyotyping, Chromosomal studies in hematological disorders (PBLC and Bone marrow), FISH	**16**
IV	Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of radioactive material. Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis	**16**
TOTAL		**64**

Title of the Paper: Diagnostic Molecular Biology (Lab) **Paper code: MLT242M512**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Students can explored the structure and function of nucleic acids, learning how DNA replication and transcription occur in living cells.
- Students can gained practical experience with PCR techniques for amplifying DNA and applying blotting methods like Southern and Western blotting for molecular analysis.
- Students can worked with flow cytometry, stem cell banking, and prenatal diagnosis to understand their real-world applications in clinical settings.

Recommended Books:

- Basic Biotechnology (Paperback) By Colin Ratledge and Bjorn Kristiansen. Cambridge University Press.

Modules	Topics (if applicable) & Course Contents	Periods
I.	• Isolation of DNA fromblood and bacterial cells • Estimation of DNA • Isolation of plasmids from bacterial cells • Separation of DNA by Agarose gel electrophoresis • Demonstration of thermal cycler and PCR Gel documentation & photography	**18**
II	• HIV test by Western Blotting • Demonstration of PCR HLA B-27 • Demonstration of PCR HIV • Demonstration of PCR MTB • Mitotic and meiotic stages • Separation of haemoglobin	**18**
	TOTAL	**36**

- Introduction to Biotechnology (Paperback) By William J. Thieman and Michael A. Palladino. Benjamin Cummings; US Ed edition.
- Recombinant DNA Principles and Methodologies By James Joseph Greene, CRC Press.

Reference Book:

- Molecular Biotechnology: Principles and Applications of Recombinant DNA (Paper-back) By Bernard J Glick and Jack J Pasternak. Publisher: American Society for Microbiology.
- Laboratory Techniques in Biochemistry and Molecular Biology; DNA sequencing (Vol 10). By J Hindley. Elsevier Biomedical

Semester -V

Detailed Syllabus

Name of the Subject: Basic Blood banking (Theory and Lab)		**Type of Course: Major**
Paper Code: MLT242M503/ MLT242M513		**Course Level: 300**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding blood banking.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** the basic knowledge on blood banking understanding its history and types of blood grouping.	**BT 1**
CO 2	**Explain** about the blood grouping and different types of cross matching.	**BT 2**
CO 3	**Apply** the knowledge of blood banking enabling them the criteria for donor selection and care.	**BT 3**
CO 4	**Analyse** the various blood components and the QC used in blood banking.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	History of blood group, ABO blood grouping and Other Blood grouping system. Donor selection & phlebotomy, preservation and storage of blood. Importance types and principle of blood grouping systems methods.	**16**
II	Blood grouping- forward and reverse grouping. Preparation of pooled ABO cells. Cross matching grading of reactions. Rh typing slide and tube method, DU testing Coombs test direct and indirect	**16**
III	Compatibility testing and emergency crossmatching Donor selection, post donation care, adverse effect of blood transfusion, Testing for transfusion transmitted diseases	**16**

IV	Blood components preparation and their uses- PRBC, FFP, Platelet concentrate, cryoprecipitate. Quality control – methods, reagents, tests methods, products.	**16**
TOTAL		**64**

Title of the Paper: Basic Blood Banking (Lab) **Paper code: MLT242M513**

Modules	Topics (if applicable) & Course Contents	Periods
I.	ABO blood grouping (forward and reverse) tube and slide method. Preparation of pooled red cells (A, B and O). Procedure of blood collection in blood bank.	**18**
II	Crossmatching Techniques, Major, Minor, Saline, Albumin, Coomb's Coomb's test (direct and indirect) Testing for transfusion transmitted diseases	**18**
TOTAL		**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Students can draw the chart showing blood components separation
- Students can make a chart explaining the different types of blood group system.

Text Books:

1. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
2. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house

References:

1. Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publishers
2. Textbook of Medical laboratory Technology , RamnikSood, Jaypee publishers

Level: Semester -V

Detailed Syllabus

Name of the Subject: Clinical Parasitology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M504/MLT242M514		**Course Level: 300**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Medical Parasitology.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	Recall basic facts and definitions related to parasitology, including the names and features of various and parasites	**BT 1**
CO 2	Explain the importance of parasites in both the environment and human health, explaining their biological roles and impact on individuals.	**BT 2**
CO 3	Organize the practical skills to work with samples, employing methods like staining, culturing, and microscopy to identify fungi and parasites in real-world scenarios.	**BT 3**
CO 4	Analyse and evaluate clinical data and case studies, interpreting symptoms and laboratory results to diagnose infections and suggest effective treatments.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	An elementary study of the types of animal associations parasitism commensalisms and symbiosis. Types of parasites. Classification of protozoan & Helminthes	**16**
II	Protozoa: Entamoeba, Dientamoeba, Iodamoeba, Embadomonas, Trichomonas, Chilomastix, Enteromonas, Trypnosomes, Leishmania, Giardia, Plasmodium, Isospora, Eilmeria and Balantidium, Toxoplasma	**16**

III	Platyhelminthes, Diphyllobothrium, Sparganum, Taenia, Echinococcus, Hymenolepis, Schistosoma, Fasciola, Fasciolopsis, Clonorchis, Peragonimus. Nemathelminthes: Ascaris, Ancylostoma, Necator, Strongloides, Trichinella Enterobius, Trichurias, Wucherei, Brugia, Loaloa, Onchocerca, Dracunculus	**16**
IV	Collection and preservation of specimens for parasitological examination, preservation of specimens of parasitic eggs and embryos, Preserving Fluids, Transport of specimens Detection of intestinal parasites: Detection and identification of amoebae and other intestinal protozoa and other parasites. Examination of Blood parasites: Thick and Thin smears for malaria and Filaria and other parasites. Concentration methods.	**16**
TOTAL		**64**

Title of the Paper: Clinical Parasitology (Lab) **Paper code: MLT242M514**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Preparation of stains and reagents: Leishman, Giemsa, Fields, Carbol fuschin and phosphate buffer, Macroscopic and microscopic examination of stool for adult worms, ova, cysts, larvae.	**18**
II	Concentration techniques for intestinal parasites in stool, Preparation of culture media for parasite cultivation, Preparation of thick and thin smear	**18**
TOTAL		**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Exposure to microbiology samples in the lab
- Perform different experiment on detection of parasites

Text Books:

1. Text Book of Parasitology by K.D. Chatterjee, Chatterjee Medical Publishers, Calcutta.
2. Parasitic diseases in man by Richard Knight English Language Book Society (ELBS)
3. .Mackie and McCartne; Practical Medical

Reference Books:

4. Microbiology Volume 1 & 2, 14th edition (2007),Elsevier
5. Geo. F. Brooks,Stephen A. Morse & Karen C. Carroll; Jawetz, Melnick, & Adelberg'sMedical Microbiology, 27th edition (2016),
6. Text book of Medical Parasitology by S.C.Parija

SYLLABUS (6th SEMESTER)

Semester -VI

Detailed Syllabus

Name of the Subject: Virology (Theory+Lab)		**Type of Course: Major**
Paper Code: MLT242M601/ MLT242M611		**Course Level: 300**
Total credits: 4	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-2-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding medical virology

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	Recall the medically important parasites, including protozoa and helminths, and their life cycles along with principles of methods	**BT 1**
CO 2	Explain on the structure, classification, and replication of viruses relevant to human health	**BT 2**
CO 3	Apply appropriate analytical equipment and molecular diagnostic methods for parasite identification test.	**BT 3**
CO 4	Analyze the process of antiviral therapy, vaccine development, and emerging viral infections.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	General properties of virus. Structure & symmetry of virus. Classification of viruses. Cultivation of viruses. Viral Replication Cycles. Lab diagnosis of viral disease. Pathogenesis & control of viral disease. Bacteriophages.	**16**
II	Common viral disease – mode of infection, spread. Laboratory Diagnosis – Polio, Influenza, Para influenza, Mumps, Measles, Rubella, Respiratory syncitial, Rhino, Rota, Hepatitis, arbo viruses prevalent in India (Dengue, West Nile, Japanese Encephalitis, KFD), Chicken pox, Adeno, Papova, Herpes, HIV, Cytomegalo viruses, etc..	**16**

III	Slow and oncogenic viruses: scrapie, kuru and animal virus. Viral Diseases (Pathogenesis, clinical features & Lab. Diagnosis): Rabies, Chikungunya, . Cell culture and observation of effect viruses on cell culture: Technique, procedure and interpretation of result.	**16**
IV	Emerging viral infections: SARS, MERS CoV, Zika, Crimean Congo hemorrhagic Fever, Nipah, Influenza viruses etc. Elementary Knowledge of viral vaccines, types and its biological role in humans. Bacteriophage- general characters, growth, multiplication, lytic cyle, lysogenic cycle, Phage typing.	**16**
TOTAL		**64**

Title of the Paper: Virology (Lab) **Paper code: MLT242M611**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Quantitative estimation HIV by ELIZA method and demonstration of RIA staining.	**18**
II	Quantitative estimation HbSAg by ELIZA method and demonstration of RIA staining.	**18**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- ELISA technique demonstration
- Exposure to microbiology samples in the lab

Text Books:

- Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
- Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house
- Textbook of Medical laboratory Technology , RamnikSood, Jaypee publishers

References:

- Dacie and lewis practical Haematology, Barbara J Bain, Imedla Bates, Mike A Laffan,12th edition, Elsevier publications
- Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publishers

Level: Semester -VI

Detailed Syllabus

Name of the Subject: Advanced Blood banking (T+P)		**Type of Course: Major**
Paper Code: MLT242M602/ MLT242M612		**Course Level: 300**
Total credits: 3	**Scheme of Evaluation: T+P**	**L-T-P-C: 3-0-1-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Advance Immunohematology and Blood banking.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the formation of blood grouping and identify the different blood group system	**BT 1**
CO 2	**Classify** the different types of antigens and antibodies and their role in Immuno Haematology and Transfusion medicine.	**BT 2**
CO 3	**Apply** the concept of various component of collection, demonstrating the ability to diagnose various disorder by identifying the different blood component transfusion.	**BT 3**
CO 4	**Analyze** the skills required to precisely prepare pool cells and the expertise needed to perform apheresis.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**

I.	The prime concern of this subject to learn about the concept of blood grouping, blood collection, infectious markers determination, compatibility testing and quality control involved in blood transfusion services, Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system. Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method.	**16**
II	Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method. Other blood group system such as Lewis, MNS, Kell Duffy etc. Anticoagulants and preservative used in blood bank, Donor selection criteria, Blood collection and processing.	**16**
III	Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination. Blood components and its preparation, preservation, storage and transportation	**16**
IV	Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN in details. Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis. Quality control of reagents, equipments, blood components used in transfusion medicine.	**16**
TOTAL		**64**

Title of the Paper: Advance Blood banking (Lab) **Paper code: MLT242M612**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Blood grouping- ABO grouping, Forward grouping (Slide & Tube), Reverse grouping- Preparation of pooled A, B & O cells. Rh- antibody titration, direct and indirect, Preparation of coombs control cells, Compatibility testing. Other methods of grouping, Rh grouping & Rh typing (slide and tube method)	**18**
II	Selection of blood donor, Crossmatching Techniques, Major, Minor, Saline, Albumin, Coomb's. Emergency Cross matching, pre and post Blood collection of donor. Donor selection, Post donation care, Preservation and storage of blood, Preparation and storage of blood components.	**18**
	TOTAL	**36**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**36**	**20**

Experiential learning activities may include:

- Perform DLC count and identify different WBC
- Lab testing and applying the theory knowledgep

Texts Books:-

1.Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications

2. Ochei J &KolhatkarA(2000),Medical Laboratory Science: Theory & Practice, 3rd edition,Mcgraw Hill Education

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

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

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

References:

1. Essentials of Hematology by Haufbrand .

2. Practicals in Hematology by J.V. Dacie.

3. Medical Laboratory Technology by Lynch.

Semester -VI

Detailed Syllabus

Name of the Subject: Enzymology and Nutrition		**Type of Course: Major**
Paper Code: MLT242M603		**Course Level: 300**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Advance Biochemistry and Enzymology.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the properties of enzymes and nutrition and process of diagnosis of various laboratory test related to liver function and kidney function test	**BT 1**
CO 2	**Explain** the various experiments related to renal, thyroid and liver disorder and the disorders due to nutrition deficiency	**BT 2**
CO 3	**Identify** the specific organ failure based on the different parameters of liver, thyroid and kidneys and nutritional disorders	**BT 3**
CO 4	**Analyse** and understanding the reaction and properties od isoenzymes and their causes of elevation.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	Iso-enzymes:Lactate dehydrogenase, creatine kinase, aspartate amino amylase, isocitrate dehydrogenase., Enzymes as therapeutic agents, Enzymes used for diagnosis . Specimen collection and analysis.Collection of sample, sample acceptance and rejection criteria, transport of sample, Post-Collection Handling, Ethical and Legal Considerations, Time Sensitivity of Samples, Additional Factors Affecting Sample Integrit storage of specimen for	**16**

	appropriate test, reference ranges.	
II	Organ Function Test: Liver function tests- Tests for Liver Function, Serum bilirubin, Classification of jaundice, Bile acids and bile salts, Tests based on metabolic capacity of liver, Tests based on synthetic function. Renal function tests- Urea clearance tests, Endogenous creatine clearance tests, Tests for renal blood flow, Test based on tubular function, Water dilution tests.	**16**
III	Gastric function tests- Test for determining gastric function, Examination of resting contents, Fractional gastric analysis, Histamine stimulation tests. Thyroid function tests- Tests based on primary function – RIU,PBI131. Test based on blood levels of thyroid hormones – T3, T4,TSH. Test based on metabolic effects of thyroid hormone, Scanning of thyroid gland.	**16**
IV	Importance of food and nutrition in day today life, Role of nutrition in maintaining health, Recommended Dietary Allowances (RDA). Macronutrients: Carbohydrates, Proteins and Fats – definition, Function, Source, Digestion and Absorbtion, disorders. **Micronutrients: Definition**, Classification – water soluble and fat soluble, Fat soluble – A,D,E,K vitamins, Water soluble – C,B, Pectin, lipoic acid, inositol etc., RDA, Rickets, osteomalasia, scurvy, beri-beri, pellagra, pernicious anaemia. Principal mineral elements, essential trace elements, Calcium and phosphorus metabolism, Magnesium metabolism, Iron, zinc, copper metabolism.	**16**
TOTAL		**64**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**00**	**26**

Experiential learning activities may include:

- Students can perform various laboratory test such as lactate dehydrogenase and creatine kinase to learn how they help diagnose and treat diseases.
- Students can perform various organ function tests, including liver, renal, and gastric function assays, to assess metabolic and synthetic activities
- Students can apply proper specimen collection techniques, and understanding factors affecting sample integrity

- They can prepare a chart to identify RDA of food and vitamins.

Texts:

1.Lehinger Principle of Biochemistry, David L Nelson, 7th edition, WH freeman Publishers

2. Fundamentals of biochemistry,JLjain and Sanjay Jain,S Chand Publishers.

Reference Book:

1. Text book of Medical Biochemistry – MN Chaterjee, Rana Shinde, Jaypee publishers.

2. Biochemistry, U. Sathyanarayana, Elsevier

3. Harper's Biochemistry,28thedition, Robert K Murray, Tata McGraw publishers

Semester -VI

Detailed Syllabus

Name of the Subject: Medical Law and Patient Safety		**Type of Course: Major**
Paper Code: MLT242M604		**Course Level: 300**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding the medical laws and requirements needed to follow for patient safety.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** and identify risks and implement strategies for minimizing harm in clinical settings.	**BT 1**
CO 2	**Classify** the roles and responsibilities of medical professionals in accordance with national and international health laws.	**BT 2**
CO 3	**Apply** principles of patient safety to identify risks and implement evidence-based strategies for minimizing harm in clinical settings.	**BT 3**
CO 4	**Analyze** ethical and legal issues in medical practice including informed consent, negligence, malpractice, and patient rights.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Medical ethics –Definition-Goal-scope , Introduction to code of conduct Basic principles of medical ethics – confidentiality Malpractice and negligence – rational and irrational drug therapy Ethics in the profession of Medical Laboratory Science	**16**
II	Medico legal aspects of medical records – Medico legal case and type-Records and document related to MLC – ownership of medical records – Confidentiality Privilege communication – Release of medical information – Unauthorized disclosure – retention of medical records – other various aspects	**16**
III	Role Of Medical Records In Health Care Management: Computers for Medical records, Developments of computerized medical record information processing system(EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual	**16**
IV	Infection prevention and control – Evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene and use of Personal Protective Equipment (PPE)], Prevention & control of common healthcare associated infections, Components of an effective infection control program, and Guidelines (NABH and JCI) for Hospital Infection Control	**16**
TOTAL		**64**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**00**	**26**

Experiential learning activities may include:

- Students can understand the different laws implemented for governing healthcare.
- Students can discuss on the different type of diagnosis and treatment required for patient care.

Recommended Books:

1. VP Singh; Legal Issues In Medical Practice: Medicolegal Guidelines For Safe Practice., 1st edition (2015) Jaypee Brothers Medical Publishers.
2. S.A. Kelkar; Hospital Information Systems: A Concise Study, Estern Economy edition (2010), Prentice Hall India Learning Private Limited.
3. GD Mogli; Medical Records Organization and Management, 2nd edition (2016), Jaypee Brothers Medical Publishers

4.

Reference Book:

1. The Essentials of Patient Safety by Charles Vincent
2. Laboratory quality control and patient safety by De Gruyter

Semester -VI

Detailed Syllabus

Name of the Subject: Biostatistic and Research Methodology		**Type of Course: Major**
Paper Code: MLT242M605		**Course Level: 300**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Biostatistics and Research Methodology.

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** basic definitions and facts related to biostatistics and research methodology.	**BT 1**
CO 2	**Explain** their significance in research, particularly in terms of data analysis and result interpretation.	**BT 2**
CO 3	**Identify** with the help of biostatistical tools and research methodology to handle actual data, analyze it, and make decisions based on their findings.	**BT 3**
CO 4	**Analyse** and break down complex research articles or data sets to evaluate their design, methodology, and statistical rigor.	**BT 4**

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Introduction:** Introduction to research methodology: meaning, objectives of research, types of research, research approaches, significance of research, research process, criteria of good research, defining research problem: selecting the problem necessity and techniques in defining the problem.	**16**
II	**Research, sample design and data collection: Research Design**: need and features of good design, types, basic principles of experimental design, developing a research plan. **Sample design:** criteria for selecting a sample procedure, characteristics of good sampling procedure types of sample design, selecting random samples. **Methods of data collection:** Collection of primary data, observation method, interview method, collection of data through questionnaire and schedules and other methods. Collection of secondary data, selection of appropriate method for data, collection, case study method, guidelines for developing questionnaire, successful interviewing, survey vs. experiment	**16**
III	**Processing and analysis of data:** data analysis (elements), statistics in research, measures of central tendency, dispersion, asymmetry, regression analysis, multiple correlation and regression, partial correlation, association in case attributes **Sampling Fundamentals**: Definition, need, central limit theorem, sampling theory, concept of standard error, estimation, estimating population mean, proportion, sample size and its determination	**16**
IV	**Testing of hypothesis:** Meaning basic concepts, important parametric tests, limitations of tests of hypothesis. Chi-square test: Applications, steps characteristics, limitations. Analysis of variance and co-variance: basic principles, techniques, applications, assumptions and limitations. Analysis of non-parametric tests	**16**
TOTAL		**64**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**00**	**26**

Experiential learning activities may include:

- Students can study research articles and apply their skills
- Apply statistical knowledge for analysis of data.

Texts Books:

1. "Biostatistics: A Foundation for Analysis in the Health Sciences" by Wayne W. Daniel
2. "Biostatistics for the Biological and Health Sciences" by Marc M. Triola and Mario F. Triola

Reference Book:

1. "Fundamentals of Biostatistics" by Bernard Rosner
2. "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar

Semester -VI

Detailed Syllabus

Name of the Subject: Quality control and Bio safety		**Type of Course: Major**
Paper Code: MLT242M606		**Course Level: 300**
Total credits: 3	**Scheme of Evaluation: T**	**L-T-P-C: 3-0-0-3**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Quality control and Bio safety

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** on the importance of quality control, and other processes required for patient care and hospital management.	**BT 1**
CO 2	**Classify** the chart on quality control, the methods to deal with poisoning and management of the outcome.	**BT 2**
CO 3	**Apply** the knowledge on practical aspect to deal with critical cases, to treat patients with drugs poisoning and on the process of automatic techniques.	**BT 3**

CO 4	**Analyze** the waste categories, analyse the symptoms of poisoning, legal aspects in medical profession and will be able to perform quality control.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Laboratory Planning**: General principle, Classifications of labs, Space requirement, Components and functions of lab, Staffing the laboratory, job specifications, Ethical principle and standard for Clinical laboratory professional, Good laboratory practice	**16**
II	**Awareness/Safety in a clinical laboratory:** Laboratory hazards, Safety programs, First Aid, Hazardous waste and transport of Hazardous material. HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, drug Resistant Tuberculosis **Care of Laboratory Glassware, Equipments, Instruments and Chemic al:** Care and Cleaning of Glassware, Lab chemicals, their proper use and care, Labelling, Biomedical Introduction and importance of calibration and Validation of Clinical Laboratory instrument	**16**
III	**Quality Management system:** Introduction, Quality assurance, Quality control system, Internal and External quality control, quality control chart Sample analysis: Introduction, factors affecting sample analysis (Sample rejection criteria), reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from referral laboratories, release of examination results, alteration in reports, Ethics in relation to Pre-Examination procedures, Examination procedures, reporting of results, preserving medical records	**16**
IV	**Audit in a Medical Laboratory:** Introduction and Importance, NABL & CAP, (LJ curves, Westguard rules, NABL, ISO guidelines), Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation	**16**
TOTAL		**64**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**00**	**26**

Experiential learning activities may include:

- Students can understand the different types of error occurring in the laboratory
- Students can discuss on the different type of diagnosis and treatment required for patient care.

Recommended Books:

- Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states.
- Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications

Reference Book:

- Hugo W.B and Russel A.D, Pharmaceutical Microbiology, 7thedn, 2004, Blackwell Scientific publications, Oxford London.
- Hospital Management & its Monitoring: Madhuri Sharma (Jaypee Brothers, Medical Publishers (P) Ltd. New Delhi)
- Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications

SYLLABUS (7th SEMESTER)

Level: Semester -VII

Detailed Syllabus

Name of the Subject: Techniques in Clinical Pathology and Body Fluid Analysis		**Type of Course: Major**
Paper Code: MLT242M711		**Course Level: 400**
Total credits: 4	**Scheme of Evaluation: P**	**L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding**:** Techniques in Clinical Pathology and Body Fluid Analysis

Course Outcomes:

On successful completion of the course the students will be able to:		
CO Level	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the fundamental principles and practices of clinical pathology and the analysis of body fluids including urine, CSF, semen, stool, and serous fluids.	**BT 1**
CO 2	**Explain** the methods of collection, preservation, and routine examination techniques for various body fluids, including interpretation of normal and abnormal findings.	**BT 2**
CO 3	**Develop** skills in performing and interpreting routine laboratory procedures for the analysis of urine, stool, and other body fluids using both manual and automated	**BT 3**
CO 4	**Analyse** clinical data and laboratory results for accurate diagnosis, with emphasis on differentiating pathological findings in body fluid examinations.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Overview of Clinical Pathology** • Role of the clinical pathology lab • Pre-analytical variables and sample handling **Urine Analysis** • Collection, preservation, and types of urine samples • Physical examination (color, clarity, volume, odor, specific gravity, pH) • Chemical examination (protein, glucose, ketones, bilirubin,	**16**

	urobilinogen, blood) • Microscopic examination of urine sediment Automation in urine analysis	
II	**Cerebrospinal Fluid (CSF), Sputum Analysis, Semen Analysis, Synovial, Peritoneal, and Pleural Fluids:** • Collection, preservation, and processing • Normal vs abnormal findings • Clinical significance of analysis • Microscopy (bacterial, fungal, parasitic detection) Routine and special tests	**16**
III	**Stool and Gastric Juice Examination:** **Stool Examination** • Collection and preservation • Physical, chemical, and microscopic analysis • Detection of occult blood and parasites **Gastric Analysis** • Collection of gastric contents • Analysis of free and total acidity • Tubeless gastric analysis	**16**
IV	Advanced Techniques and Quality Control **Automated Body Fluid Analysis** • Use of automated analyzers in CSF, urine, and semen **Cytological Techniques** • Pap smear, FNAC basics • Applications in body fluid cytology **Quality Assurance in Clinical Pathology** • Internal and external quality control • Importance of documentation, error reporting	**16**
TOTAL		**64**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
64	**00**	**26**

Experiential learning activities may include:

- The students know about the specimen collection in the clinical laboratory.
- Experiential learning on health camp conduction and detection of disorders as well as hands on training.

Recommended Books:

1. **Ramnik Sood** – *Medical Laboratory Technology: Methods and Interpretations*
2. **Kanai L. Mukherjee** – *Medical Laboratory Technology, Vol I–III*
3. **Godkar & Godkar** – *Textbook of Medical Laboratory Technology*

Reference Book:

1. **S. Ramachandran** – *Clinical Laboratory Technology Manual*
2. **P. S. Baveja** – *Practical Microbiology* (For body fluid infection-related aspects)

Level: Semester -VII

Detailed Syllabus

Name of the Subject: Analytical Techniques in Clinical Biochemistry **Type of Course: Major**

Paper Code: MLT242M712 **Course Level: 400**

Total credits: 4 **Scheme of Evaluation: P** **L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Analytical Techniques in Clinical Biochemistry

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the properties of enzymes and process of diagnosis of various laboratory test related to liver function and kidney function test.	**BT 1**
CO 2	**Explain** the various experiments related to renal, thyroid and liver disorder.	**BT 2**

CO 3	**Identify** the different instruments used in biochemistry laboratory	**BT 3**
CO 4	**Analyse** various biochemical examination of urine understanding their causes of abnormal result.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Anticoagulant vials. Preparation of different percentage solution Preparation of normal and molar solution. Demonstration of photocolorimeter Demonstration of centrifuge. Demonstration of ph meter Demostration of spectrophotometer.	**22**
II	Liver function tests – Total Bilirubin, direct and Indirect Bilirubin, Total Protein, Albumin, SGOT, SGPT. Renal Function Test – Estimation of urea, Uric acid and Creatinine,	**22**
III	Demonstration of estimation of glycosylated hemoglobin (HbA1C), Glucose tolerance test (GTT). Urine Examination R/E, Urinary Bile salt, Urinary Bile pigments, Urinary Urobilinogen, Total Protein, Albumin. Biochemical estimation of urine through use of strips.	**22**
IV	Vitamins and hormone estimation. Thyroid Function Test (T3,T4,TSH): ELISA. Estimation of Alkaline Phosphatase, Estimation of Na+, K+ and Ca+, Quality control in Biochemistry laboratory.	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING

00	**88**	**32**

Experiential learning activities may include:

- Students can perform various organ function tests, including liver, renal, and gastric function assays, to assess metabolic and synthetic activities
- Students can apply proper specimen collection techniques, and understanding factors affecting sample integrity

Texts:

1. Lehinger Principle of Biochemistry, David L Nelson, 7th edition, WH freeman Publishers
2. Fundamentals of biochemistry,JLjain and Sanjay Jain,S Chand Publishers.

Reference Book:

1. Text book of Medical Biochemistry – MN Chaterjee, Rana Shinde, Jaypee publishers.
2. Biochemistry, U. Sathyanarayana, Elsevier
3. Harper's Biochemistry,28thedition, Robert K Murray, Tata McGraw publishers

Level: Semester -VII

Detailed Syllabus

Name of the Subject: Clinical Hematology and Coagulation Studies **Type of Course: Major**

Paper Code: MLT242M713 **Course Level: 400**

Total credits: 4 **Scheme of Evaluation: P** **L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Clinical Hematology and Coagulation Studies.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the basic knowledge on the blood cells, their formation, and the lab investigations.	**BT 1**

CO 2	**Explain** on the procedure of blood processing and staining.	**BT 2**
CO 3	**Develop** their knowledge on formation of WBC, platelets, methods of counting and clinical importance.	**BT 3**
CO 4	**Analyse** the importance of haemostasis, coagulation and preparation of bone marrow smear and process and types of staining.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Blood collection, Anticoagulants used in Haematology, Red cell indices, Erythrocyte Sedimentation Rate, Pack Cell Volume, Platelet count, Absolute Eosinophil count, Reticulocyte count, Stains used in Haematology.	**22**
II	Preparation of Blood film, Preparation of leishman stain, Interpretation of peripheral smear, Differential count, Investigation including serum Iron & TIBC. Different morphological investigation of pheripheral blood smear, microcytic, hypochromic, normocytic, normocromic distinction and quality control in the laboratory.	**22**
III	Routine hemorrhagic disorder tests: BT, CT, Clot retraction and lysis time, platelet count, platelet aggregation studies. General approach to investigation of hemostasis: PT, APTT, TT, Mixing studies. Coagulation factor assays, Factor VIII inhibitor studies,	**22**
IV	Platelet Aggregation studies, thrombin work-up, D-dimer tests, FDP. Protein C, protein S, anti-thrombin – III, Factor V Leiden, Antiphospholipid antibody workup.	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**88**	**32**

Text Books:

1. Practical Haematology- Daicie & Lewis, Barbara J. Bain, Imedlda Bates, Make A Laffan, SMitchell
Lewis
2. Textbook of Medical Lab Technology- Praful B. Godkar.
3.Clinical Haematology in Medical Practice- de Gruchy.
4.Clinical Haematology Principles, procedures, correlations by E. Anne Stiene Martin, Chery A.
Lotspiech- steininger, John A. Koepke.
5.Principles & Practice of Transfusion Medicine by RN Makroo.
6.The Textbook of Blood Bank and Transfusion Medicine -Satish Gupte.

Reference Books:

1.Medical Laboratory Technology Methods & interpretation- Ramnik Sood.
2.Textbook of Medical Laboratory Technology- Praful B. Godkar, Darshan P Godkar.
3.Manual of Transfusion Medicine-Ramadas Nayak.

Level: Semester -VII

Detailed Syllabus

Name of the Subject: Histopathological and Cytological Techniques	**Type of Course: Major**
Paper Code: MLT242M714	**Course Level: 400**
Total credits: 4 **Scheme of Evaluation: P**	**L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Histopathological and Cytological Techniques

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Recall** the terms used in histo and cytology, its classification, the importance, process of collection of specimens.	**BT 1**

CO 2	**Explain** on the procedure of tissue processing, fixation and staining	**BT 2**
CO 3	**Develop** their knowledge on process of Various types of fixatives used in a routine histopathology laboratory	**BT 3**
CO 4	**Analyse** the process of cell block preparation, fixation, different types of stains used in cytology and requirements for establishment of labs.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Cryostat sectioning, its applications in diagnostic histopathology. Special Staining Procedures for detection of Connective tissue elements, Trichrome staining, muscle fibers, elastic, reticulin fibers,collagen fibers etc. Metachromatic staining such as Toludine blue on frozen sections Principles of metal impregnation techniques. Demonstrationand identification of minerals and pigments, removal of Pigments/artifacts in tissue sections	**22**
II	Tissue requiring special treatment i.e. eye ball, bone marrow, and muscle biopsy, undercalcified or unclarified bones, whole brain, and whole lungs including other large organs. Enzyme histochemistry: Diagnostic applications and the demonstration ofPhosphatases, Dehydrogenases, Oxidases & Peroxidases. Museum techniques. Micrometry and Morphometry	**22**
III	Cryostat sectioning, its applications in diagnostic cytopathology Enzyme Cytochemistry: Diagnostic applications, Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases, Vital staining for Sex Chromatin, Aspiration cytology: Principle, Indications & utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics	**22**
IV	Exfoliative cytology (Papanicolaou technique for the staining of cervical smears) Cervical cytology Fluid Cytology, Urine, CSF, Body Fluids (Pleural, Pericardial, Ascitic) Automation in cytology, Liquid based cytology: Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry	**22**

TOTAL	88

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**88**	**32**

Experiential learning activities may include:

1. Students can perform urine analysis including physical, chemical, and microscopic examination.
2. Students can process and examine body fluids like CSF, semen, sputum, and serous fluids for diagnostic purposes.
3. Students can identify parasites and occult blood in stool and analyze gastric contents for acidity.
4. Students can participate in quality control exercises and learn proper documentation and error reporting.

Texts:

1. Handbook of Histopathological Techniques by C F A Culling
2. Medical Lab technology by Lynch
3. An Introduction to Medical Lab Technology by F J Baker and Silverton
4. Bancroft‘s Theory and Practice of Histopathological Techniques by John D Bancroft
5. Diagnostic Cytology by Koss Volume -II.

Reference Book:

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

Semester -VII

Detailed Syllabus

Name of the Subject: Microbiological methods and Culture technique (Practical)

Type of Course: Major **Course Level: 400**

Paper Code: MLT242M715 **Scheme of Evaluation: P** **L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Microbiological methods and techniques.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** biosafety levels and personal protective equipment.	**BT 1**
CO 2	**Demonstrate** correct handling of microbial cultures.	**BT 2**
CO 3	**Identify** microbial colonies based on shape, size and growth patterns.	**BT 3**
CO 4	**Analyze** the skills to accurately measure the turbidity and plotting a bacterial growth curve using absorbance method.	**BT 4**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Introduction to Microbiological techniques:** Different aseptic techniques including Sterilization, flame inoculation. Demonstration of Autoclave, hot air oven and filter sterilization. Aseptic transfer using inoculating loop and pipette, preparation of workbench for microbial work.	**22**
II	**Preparation of culture media**: Prepare different selective, differential, enriched media by using appropriate sterilize techniques. P^H adjustment and dispensing into petri dishes or test tubes. Identification of media spoilage and quality control.	**22**
III	**Inoculation and culture techniques:** Various culture techniques: Streak plate, pour plate and spread plate. Pure culture isolation by subculturing and maintenance the pure culture. Observe colony morphology and growth patterns in broth and agar slants.	**22**
IV	**Observation and Identification of bacterial growth:** Identify microbial colonies based on shape, size, colour, elevation and margin, Observation of turbidity and pellicle in broth cultures, record growth patterns in different media using absorbance method.	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**00**	**32**

Experiential learning activities may include:

- Students can learn Hands on demonstration of Sterilization methods.
- Students can perform quality control exercise for check contamination spoilage and test growth.
- Students can study turbidity and pellicle differences in various media.

Texts Books:-

1. Textbook of Microbiology- Anathanarayan and Paniker's.
2. Textbook of Microbiology- CP Baveja.
3. Essentials of Medical Microbiology-Apurba S Sastry, Sandya Bhat.

References:

1. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house

2. A text book of Microbiology- S. Chand, RC Dubey, DK Maheswari

SYLLABUS (8th SEMESTER)

Level: Semester -VIII

Detailed Syllabus

Name of the Subject: Immunological and serological testing		**Type of Course: Major**
Course Level: 400		
Paper Code: MLT242M811	**Scheme of Evaluation: P**	**L-T-P-C: 0-0-8-4**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Microbiological methods and techniques.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Introduce** fundamental immunological principles and basic laboratory practices.	**BT 1**
CO 2	**Demonstrate** the Zone of equivalence with proper handling biological specimens.	**BT 2**
CO 3	**Perform** ELISA and rapid immunoassays used in clinical diagnostics.	**BT 3**
CO 4	**Analyze** the skills to accurately perform the specialized tests and understand their clinical relevance.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Introduction to Immunological techniques:** Overview of Antigen-Antibody reactions, Safety procedures in an Immunology lab, Sample collection, labelling and storage for serological tests, Preparation and dilution of reagents and controls, demonstration of Precipitation rings.	**22**
II	**Precipitation and Agglutination tests**: Slide agglutination test: WIDAL, Tube agglutination test, Radial Immunodiffusion, Double Immunodiffusion, Latex agglutination test: CRP, RF.	**22**

III	**ELISA and Rapid immunoassay:** Principle and setup of Indirect ELISA, Sandwich ELISA, performing HIV rapid test, Hepatitis B surface antigen test, Troubleshooting and quality control of ELISA, micropipette precision.	**22**
IV	**Advanced serological techniques:** Complement fixation test, Western blot, Immunofluorescence assay, Flow cytometry, case study interpretation for results and clinical scenarios. Awareness of automation and molecular serology.	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**00**	**32**

Experiential learning activities may include:

- Students can learn hands on training in safe practices and protocols in an immunology lab.
- Students can perform and observe precipitation ring demonstrations to understand antigen-antibody reactions.
- Students can demonstrate and interpret results of latex agglutination, CRP and RF tests.

Texts Books:-

4. Textbook of Microbiology- Anathanarayan and Paniker's.
5. Textbook of Microbiology- CP Baveja.
6. Essentials of Medical Microbiology-Apurba S Sastry, Sandya Bhat.

References:

1. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house.

2. A text book of Microbiology- S. Chand, RC Dubey, DK Maheswari.

Name of the Subject: Blood Banking and Transfusion Technology **Type of Course: Major**

Course Level: 400

Paper Code: MLT242M715 **Scheme of Evaluation: P** **L-T-P-C: 0-0-8-4**

Course Objectives: The objective of the course is to introduce students to gain knowledge regarding Blood Banking and Transfusion Technology.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Bloom's Taxonomy Level**
CO 1	**Recall** the basic knowledge on blood banking, understanding its history and types of blood grouping and the formation of A, B and H antigen.	**BT 1**
CO 2	**Explain** about the procedure of blood grouping and different types of cross matching.	**BT 2**
CO 3	**Develop** skills in performing and interpreting routine laboratory procedures for the analysis of antigen and antibodies in blood banking .	**BT 3**
CO 4	**Analyze** clinical data and laboratory results for accurate diagnosis, with emphasis on differentiating the abnormal findings.	**BT 4**

DETAILED SYLLABUS:

Modules	Topics (if applicable) & Course Contents	Periods
I	Blood grouping- ABO grouping, Forward grouping Slide & Tube, Reverse grouping- Slide & Tube. Rh- antibody titration, direct and indirect. Donor selection & phlebotomy, preservation and storage of blood. Importance types and	**22**
II	Preparation of pooled A, B & O cells. Grading reactions. Anti D detection, DU testing. Coombs test: Direct and indirect coombs test. Rh-antibody titration, direct and indirect, Preparation of coombs control cells, Compatibility testing. Other methods of grouping, Rh grouping & Rh typing (slide and tube method).	**22**

III	Selection of blood donors: donor eligibility guidelines, Crossmatching Techniques: Major, Minor, Saline, Albumin, Comb's. Emergency Cross matching, pre and post Blood collection of donors. Compatibility testing and emergency crossmatching Donor selection, post donation care, adverse effect of blood transfusion	**22**
IV	High risk identificatiom and deferral, confidential pre-donation counselling. Post donation care, Preservation and storage of blood: CPDA-1, Preparation and storage of blood components: Packed red blood cells, platelet concentration, fresh frozen plasma, cryoprecipitate. Quality control – methods, reagents, tests methods, products.	**22**
TOTAL		**88**

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICUM	EXPERIENTIAL LEARNING
00	**00**	**32**

Experiential learning activities may include:

- Students can make a chart explaining the different types blood group system
- Students can make a chart showing the different blood components (PRBC, FFB, Platelets, cryoprecipitate)

Text Books:

1. Practical Haematology- Daicie & Lewis, Barbara J. Bain, Imedlda Bates, Make A Laffan, SMitchell Lewis
2. Textbook of Medical Lab Technology- Praful B. Godkar.
3. Clinical Haematology in Medical Practice- de Gruchy.
4. Clinical Haematology Principles, procedures, correlations by E. Anne Stiene Martin, Chery A. Lotspiech- steininger, John A. Koepke.
5. Principles & Practice of Transfusion Medicine by RN Makroo
6. The Textbook of Blood Bank and Transfusion Medicine -Satish Gupte.

Reference Books:

1. Medical Laboratory Technology Methods & interpretation- Ramnik Sood.
2. Textbook of Medical Laboratory Technology- Praful B. Godkar, Darshan P Godkar.

3. Manual of Transfusion Medicine-Ramadas Nayak.

Semester -VII & VIII

Detailed Syllabus

12 MONTH INTERNSHIP

Subject Name: Internship/ Apprenticeship	
Credit Units: 28	Scheme of Evaluation: (P)

- There shall be 12 months of Internship after the final year examination for candidates declared to have passed the examination in all the subjects.
- During the internship candidate shall have to devote 20 hours per week for 12 Calendar months.
- The Internship should be rotatory and cover Haematology, Histology & Cytology, Biochemistry, Microbiology, Endocrinology & Automation sections of Pathology laboratory.
- Based on the attendance and work done during posting the Director/Principal/ head of institution/department shall issue 'Certificate of Satisfactory Completion' of training following which the University shall award the B.Sc. in Medical Laboratory Technology Degree or declare the candidate eligible for the same.
- No candidate shall be awarded degree without successfully completing 12 months internship.
- Institute's Director / Principal can at his discretion grant NOC to the students to do the Internship at the place of his choice provided the concerned Hospital/Pathology Laboratory fully satisfies the above criteria. For the purpose of granting NOC the candidate shall have to submit to the Institution the status of Pathology Laboratory services available at the place where he intends to do his Internship.

Level: Semester VI

DISSERTATION/PROJECT

CODE: MLT242M822
CREDIT : 12

Each candidate pursuing BMLT course is required to carry out work on selected research to carry out work on selected research project/dissertation under the guidance of a recognised post graduate teacher in same field. The dissertation/research project is aimed to train a graduate student in research methods and techniques. It includes identification of problem,

formulation, formulation of hypothesis, search and review of the literature, design of the research study, collection of data, analysis of data, interpretation of results and finally frame conclusions. The dissertation / research project should be written under following heading:

INTRODUCTION
AIMS OR OBJECTIVES OF STUDY
FORMULATION HYPOTHESIS
REVIEW OF LITERATURE
MATERIALS AND METHODS
RESULTS
DISCUSION AND INTERPRETATION
CONCLUSION
SUMMARY
REFERENCES
TABLES
ANNEXURE

SYNOPSIS Every candidate should submit a synopsis to the registrar of the university in the prescribed format containing particulars of proposed dissertation work after obtaining ethical clearance from the Institutional Ethical Committee comprising principal and other senior faculty of the college from the date of admission on or before the date notified by the university. The synopsis shall be sent through the proper channel. Such synopsis will be reviewed and the dissertation topic will be registered by the university. Synopsis should be written under following heading:-

Proposed research project topic
Introduction
Aim of Study
Objective of the study
Formulation hypothesis
Review of literature
Materials and methods
Statistics
References

The written text of synopsis shall not exceed 8(eight) pages including all the above mentioned

topics.

DISSERTATION SUBMISSION

The candidate should submit their dissertation work at the end of 10 months of second year of the M.sc. MLT course.

The candidate should submit six (6) copies of dissertation (with hard binding) to the Principle/Head of the Institution. Institute shall be submitted four (4) copies of dissertation to the registrar on the 22nd month of the commencement of course on or before the date notified by the university.

EVALUATION OF DISSERTATION

Dissertation valuation of the candidates will be conducted by the Internal and External examiners together on the basis of work, presentation and defense viva at the time of practical examination.

STANDARD FORMAT OF DISSERTATION

The written text of dissertation shall not be less than 100 pages and shall not exceed 150 pages excluding references, tables, questionnaires and annexure. It should be neatly typed (font size 12 – Time New Roman or font size 123 Arial) in double line spacing on one side of the bond paper (A-4 Size) and bound properly. The Guide and the head of the Institution shall certify the dissertation.

CHANGE OF DISSERTATION TOPIC/ GUIDE

No change in the dissertation topic/guide shall be made without prior approval from the university.

ABSTRACT

Abstract provides a brief summary of the dissertation/thesis, summing up clearly the problem examined, the methods used, and the main findings. The abstract is a one-paragraph self-contained summary of the most important elements of the paper. The abstract word limit is between 250 and 300 words. All numbers in the abstract (except those beginning a sentence) should be typed as digits rather than words. Key words (max.10) should be given, chosen from subject concerned headings. Each word should be separated by semicolon.

GENERAL PRINCIPLES

PAPER

Use only one side of high quality, plain white (unlined in any way) bond paper, minimum 20-lb weight, and "8 ½ x 11" in size. Erasable paper should not be used.

TYPE SIZE AND PRINT

The fond size should be visible to the reader, preferably Times New Roman 12 pt .No italicization.68 Size of the title should be 14 and bold; the size of sub-title should be 12 and bold. Print should be letter quality or laser (not dot matrix) printing with dark black characters that are consistently clear and dense. Use the same type of print and print size throughout the document.

PAGINATION

Number all of the pages of your document, including not only the principal text, but also all Plates, tables, diagrams, maps and so on. Roman numerals are used on the preliminary pages (Pages up to the first page of text) and Arabic numerals are used on the text pages. The numbers themselves can be placed anywhere on the page, however they should be consistent.

SPACING

Use double spacing except for long quotations and foot notes which are single spaced.

MARGINS

Margin size; "generous"- Use plenty of room on the top, bottom, left & right (1"minimum). To allow for binding, the left hand margin must be 1.5". Other margin should be 1.0". Diagrams or photographs in any form should be a standard page size, or if larger, folded so that a free left-hand margin of 1.5" remains and the folded sheet is not larger than the standard page.

PHOTOGRAPHS

Professional quality black-and-white photographs are necessary for clear reproduction. Colors are allowed, but you should be certain the colored figure will copy clearly and will not be confusing when printed in black and white.

FILE FORMAT

Dissertation format should be in Doc (Ms Word document) or PDF (portable document Format), Image file in JPG or TIFF format and audio visual in AVI (Audio Video Interleave), GIF, MPEG (moving picture expert) files format.