KAZI NAZRUL UNIVERSITY

School of Health Science and Technology Department

of Allied Health Science and Technology

UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

PROGRAM OUTLINE

Semester I

Course Code	Course Name	L - T - P	Credits	Total Marks
BMLTC101	Human Anatomy	4-0-0	4	100
BMLTC 102	Human Anatomy Practical	0-0-4	2	100
BMLTC 103	Human Physiology	4-0-0	4	100
BMLTC 104	Human Physiology Practical	0-0-4	2	100
BMLTC 105	Medical Laboratory Science and Management	4-0-0	4	100
BMLTC 106	National Healthcare Delivery System	0-0-4	4	100
AECC101	Computer Application	4-0-0	4	100
AECC102	Computer Application Practical	0-0-4	2	100
AECC103	English Communication	3-0-0	3	100
TOTAL			**29**	**900**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Semester- I

Course Name: Human Anatomy
Course Code: BMLTC101

Course Type: Core (Theoretical)	Course Details: CC-1			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course Learning Outcomes:

1. Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the human body.
2. Identify the microscopic structures of various tissues, and organs in the human body and correlate the structure with the functions.
3. Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyze the integrative and regulative functions on the organs and systems.

Module	Topics	No. of Lectures
Module 1	**Introduction to Human Anatomy:** Anatomy: Definition and its relevance Planes of the body, relationship of structures, organ system	4
Module 2	**Skeleton System:** Structure, Functions	4
Module 3	**Tissues of the Body:** Epithelium,connectivetissue,boneandcartilage,Embryology,histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues	6
Module 4	**Muscles:** Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply	4
Module 5	**Blood vessels:** Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations	6
Module 6	**Skin and appendages:** Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves	4
Module 7	**Lymphatic system:** Embryology, functions, relationship with blood vessels and organs	4

Module 8	**Glands:** Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands	4
Module 9	**Nervous system:** Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system	6
Module 10	**Brain and Cranial nerves:** Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves	6
	Total Number of Hours= 48	

Text Books:-

1. MARIANO S.H. DIFIORE: Atlas of Human Histology, 5th Ed. 1981, Lea and Feliger.
2. B.D. CHAURASIA: Handbook of General Anatomy, 2nd Ed., CBS Publishers and Distributors, New Delhi - 110 032.

Reference Books:-

1. PETER L. WILLIAMS AND ROGER WARWICK: - Gray's Anatomy - Descriptive and Applied, 36th Ed., 1980, Churchill Livingstone.
2. R. KANAGASUNTHARAM, P. SIVANANDA-SINGHAM & A. KRISHNAMURTI: Anatomy-Regional, Functional, & Clinical, P.G. Publisher, Singapore1987.

Course Name: Human Anatomy Practical
Course Code: BMLTC102

Course Type: Core (Practical)	Course Details: CC-2			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Course Learning Outcomes:

1. Utilize compound microscope to perform microscopic study of epithelial, connective, muscular and

nervous tissue.
2. Identify axial and appendicular bones of human body.
3. Practice use of Hemocytometer for enumeration of white blood cell (WBC) and red blood corpuscles (RBC).
4. Estimate bleeding time, clotting time, hemoglobin content and erythrocyte sedimentation rate (ESR).
5. Identify blood group, determine heart rate, pulse rate and record blood pressure.

Module	Topics	No. of Practical D + P*
Module 1	Study of compound microscope	2 + 2
Module 2	Identification of muscular and nervous system	4 + 4
Module 3	Identification of axial bones Identification of appendicular bones	4 + 4
Module 4	Introduction to hemocytometry	2 + 2
Module 5	Enumeration of white blood cell (WBC) count Enumeration of total red blood corpuscles (RBC) count	4 + 4
Module 6	Determination of bleeding time Determination of clotting time	2 + 2
Module 7	Determination of blood group. Determination of erythrocyte sedimentation rate (ESR).	4 + 4
Module 8	Determination of heart rate and pulse rate Recording of blood pressure	2 + 2
	Total Number of Hours= 48	

*** D - Demonstration & P - Practice**

Text Books:-

1. MARIANO S.H. DIFIORE: Atlas of Human Histology, 5th Ed. 1981, Lea and Feliger.
2. B.D. CHAURASIA: Handbook of General Anatomy, 2nd Ed., CBS Publishers and Distributors, New Delhi - 110 032.

Reference Books:-

1. PETER L. WILLIAMS AND ROGER WARWICK: - Gray's Anatomy - Descriptive and Applied, 36th Ed., 1980, Churchill Livingstone.
2. R. KANAGASUNTHARAM, P. SIVANANDA-SINGHAM & A. KRISHNAMURTI: Anatomy-Regional, Functional, & Clinical, P.G. Publisher, Singapore1987.

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.
Course Code: BMLTC103

Course Type: Core (Theoretical)	Course Details: CC-3			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course Learning Outcomes:

1. Explain the normal functioning of various organ systems of the body and their interactions.
2. Elucidate the physiological aspects of normal growth and development.
3. Describe the physiological response and adaptations to environmental stresses.
4. Know the physiological principles underlying pathogenesis of disease.

Module	Topics	No. of Lectures
Module 1	**CELL STRUCTURE & ORGANIZATION** Tissue organization Epithelium Connective tissue –Collagen fibers –Elastic fibers – Areolar fibers Cartilage – Bone Contractile tissue –striated –skeletal –cardiac –non striated –plain – myoepithelial General principles of cell physiology Physiology of skeletal muscle	6
Module 2	**BLOOD:** Composition Volume measurement & variations Plasma proteins –classification & functions. Red blood cells –development, morphology & measurements –functions & dysfunctions. White blood cells –development –classification, morphology –functions & dysfunctions. Platelets –morphology –development, functions & dysfunctions Clotting – factors –mechanism –anti- coagulants dysfunctions Blood grouping –classification –importance in transfusion, Rh factor & incompatibility Suspension stability Osmotic stability Reticulo endothelial system o Spleen, lymphatic tissue, Thymus, bone marrow, immune system, cellular, Humoral, Autoimmune	6

Module 3	**DIGESTION:** General arrangement Salivary digestion –functions & regulations Gastric digestion –functions & regulations Pancreatic digestion –functions & regulations Intestinal digestion –functions & regulations Liver & bile Functions of large intestine Neurohumoral regulations of alimentary functions, summary	4
Module 4	**EXCRETION:** Body fluids –distribution, measurement & exchange, Kidney –structure of nephron –mechanism of urine formation –composition of the urine and abnormal constituents –urinary bladder & micturition	2
Module 5	**ENDOCRINES**: Hormone mechanism –negative feed backs –tropic action –permissive action –cellular action, hypothalamic regulation Thyroid - hormones, actions, regulations Adrenal cortex - hormones, actions, regulations Adrenal medulla –hormones, actions, regulations Parathyroid - hormones, actions, regulations Islets of pancreas –hormones, actions, regulations Miscellaneous _ hormones, actions,regulations Common clinical disorders	4
Module 6	**REPRODUCTION:** Male reproductive system –control & regulation Female reproductive system –uterus –ovaries –menstrual cycle –regulation –pregnancy & delivery –breast –family planning	4
Module 7	**RESPIRATION:** Mechanics of respiration –pulmonary function tests –transport of respiratory gases- neural and chemical regulation of respiration –hypoxia, cyanosis, dyspnoea– asphyxia.	4
Module 8	**CIRCULATION:** Generalprinciples Heart: myocardium –innervation –transmission of cardiac impulse- Events during cardiac cycle –cardiac output. Peripheral circulation: peripheral resistances –arterial blood pressure –measurements –factors regulation variations –capillary circulation – venous circulation. Special circulation: coronary cerebral –miscellaneous	4
Module 9	**ENVIRONMENTAL PHYSIOLOGY** Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure	4
Module 10	**NERVOUS SYSTEM:** Neuron –Conduction of impulse –synapse –receptor. Sensory organization –pathways and perception Reflexes –cerebral cortex –functions. Thalamus –Basal ganglia Cerebellum.	6

	Hypothalamus. Autonomic nervous system –motor control of movements, posture and equilibrium – conditioned reflex, eye hand co-ordination	
Module 11	**SPECIAL SENSES** –(Elementary) Olfaction –Taste –Hearing	4
	Total Number of Hours	**48**

Text Books:-

1. L Prakasam reddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad,2008
2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008

Reference Books:-

1. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company, Japan

Course Name: Human Physiology Practical
Course Code: BMLTC104

Course Type: Core (Practical)	Course Details: CC-4			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Course Learning Outcomes:

1. Handle microscopes on their own.
2. Perform different blood tests, e.g., blood counts (RBC, WBC, platelets, Hb and differential count), blood grouping, analysis of bleeding time and clotting time.
3. Perform examination on urine and detect presence of abnormal entities.
4. Demonstrate various parts of human Endocrine and Reproductive system.
5. Perform clinical examination of respiratory system like Spirometry, Breath holding test etc.
6. Practise routine examination of cardiovascular and circulatory system, including blood pressure and pulse rate measurement.
7. Demonstrate various parts of Central Nervous System.

Module	Topics	No. of Practical D + P
Module 1	Blood test: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count, Haematocrit demonstration, ESR, Blood group & Rh. type, Bleeding time and clottingtime	4 + 4
Module 2	Digestion: Test salivarydigestions	4 + 4
Module 3	Excretion: Examination of Urine,Specific gravity, Albumin, Sugar, Microscopic examination for cells andcysts	4 + 4
Module 4	Endocrinology and Reproduction: Dry experiments in the form of cases showing different endocrinedisorders.	4 + 4
Module 5	Respiratory System: Clinical examination of respiratory system, Spirometry, Breath holding test	4 + 4
Module 6	Cardio Vascular System: Clinical examination of circulatory system, Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulserate	2 + 2
Module 7	Central Nervous System: Sensory system, Motor system, Cranial system, Superficial and deepreflexes	2 + 2
	Total Number of Hours= 48	

Text Books:-

3. L Prakasam reddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad,2008
4. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008

Reference Books:-

2. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company, Japan

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Course Name: Medical Laboratory Science and Management

Course Code: BMLTC105

Course Type: **Core (Theoretical)**	Course Details: **CC-5**		L-T-P: **4- 0 - 0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**30**	….	**70**

Couse Outcomes:

- Acquiring knowledge on different types of Microbiology, Haematology, Biochemistry and clinical pathology lab.
- Basic idea of lab setup, Organize patient files and maintain patient coding and sampling.

Module	Topics	No. of Lectures (D+P)
Module 1	**General discussion on Medical Terminology and understanding basics of various diseases.** • Coding • Assembling of patient files • Sensitization on career opportunities and role of MLS in Hospital Care	8
Module 2	• Quality Control of the product, chemicals, reagent. • Good, reliable, authentic report ,	8
Module 3	• Various types of laboratories, Standard Bio-Medical Laboratory set up. Management to the client, patient, physician, administrative authority, Marketing management and economics related to Bio-medical laboratory science.	12
Module 4	Good laboratory management practices, Improvement of laboratory operation , Signage system in laboratory and hospital	8
Module 5	ISO rules for pathological Laboratory, Set up of a laboratory on the basis of safety priority and Laboratory Biosafety Guidelines. 12. Laboratory Biosafety Level Criteria (BSL-1-4).	12
	Total Number of Hours	**48**

TEXT BOOKS:-

Medical Laboratory Technology	Kanai Lal Mukherjee
An Introduction to Medical Lab Technology	F J Baker and Silverton
Text book of Medical Laboratory Technology	P. B. Godker
Medical Laboratory Technology	K.L. Mukherjee volume III

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Course Code: BMLTC106

Course Name: National Healthcare Delivery System

Course Type: **Core (Theoretical)**	Course Details: **CC-5**		L-T-P: **4- 0 - 0**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**30**	….	**70**

Course Outcomes:

1. Discuss the preliminary idea of health care and its delivery system related to various socio-economic aspect and community-based approach.
2. Describe the different types of health policies, organizations and issues in health care delivery system in India.
3. Explain the national health programme and elaborate its objectives, targeted area, achievements and constraints.
4. Interpret the various AYUSH system of medicine and its integration/interrelation among Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy.
5. Illustrate the health scenario of public health in India based on two aspect demography and epidemiology.

Module	Topics	No of lectures
Module 1	**Concepts of Health** Definition of health; evolution in concepts of public health; public health events sanitary awakening, germ theory of disease, rise of public health in various countries, changing concepts of health- biomedical concept, ecological concept, psycho-social concept and holistic concept.	4
Module 2	**Dimensions of Health** Physical dimension, mental dimension, Social dimension etc; Common health problems in India - Communicable diseases, Non communicable diseases, MCH problems, Nutritional problems, Environmental sanitation, Glance over National Health profile.	4
Module 3	**Evolution of health care delivery systems** History of health care delivery services; Genesis of primary health care; National health policy; MDGs.	6

Module 4	**Levels of health care** Primary health care, secondary health care, tertiary health care. Primary health care-principles of primary health care, elements of primary health care.	4
Module 5	**Primary health care: Delivery of services** Introduction; Structure of health care delivery system; Delivery of primary health care services at village level; Village health guide, ASHA, ICDS: Subcentre: Primary health centre.	4
Module 6	**Secondary and tertiary health care: Delivery of services** Community Health centre; First referral unit; District hospital.	6
Module 7	**Primary health care - Current status in India** Status of health care infrastructure; Health team concept; Health insurance; Social security and social assistance in health; AYUSH.	6
Module 8	**National Health Programmes** Introduction; National Vector Borne Disease Control Programme; National Leprosy Eradication Programme; Revised National Tuberculosis Control Programme; National AIDS Control Programme; Universal Immunization Programme; National Rural Heath Mission.	4
Module 9	**National Health Programmes** Reproductive and Child Health Programme; Integrated Management of Neonatal and Childhood Illnesses; National Nutritional Anemia Prophylaxis Programme; National Programme for Control of Blindness; National Cancer Control Programme; National Mental Health Programme.	4
Module 10	**First aid** Basic terminologies; general guidelines; first aid in specific situations; Wound, bleeding, fracture, choking, burns, epistaxis, strains and sprain, animal bites (classification, causes and first aid), Cardio-pulmonary resuscitation.	6
	Total Number of Hours	**48**

Text Books

1. Park K. Park's Textbook of Preventive and Social Medicine. 23rd ed. Jabalpur:

BanarsidasBhanot Publishers, 2015.p.135-141

Reference Book:

1. Suryakantha. Textbook of Community Medicine with recent advances. 4th edition.

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Course Name: Computer Application
Course Code: AECC101

Course Type: Core (Theoretical)	Course Details: AECC-1			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course Learning Outcomes:

1. Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components
2. Understand the difference between an operating system and an application program, and what each is used for in a computer
3. Describe some examples of computers and state the effect that the use of computer technology has had on some common products
4. Be familiar with software applications
5. Understand file management
6. Accomplish creating basic documents, worksheets, presentations with their properties.
7. Experience working with email and recognize email netiquette.

Module 1

Introduction and Definition of Computer: Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices – Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes.

(Lecture 12)

Module 2

MS – DOS: Getting Started on DOS with Booting the System, Internal Commands: CHDIR(CD),CLS, COPY, DATE, DEL(ERASE), DIR, CHARACTER, EXIT,MKDIR(MD), REM, RENAME(REN), RMDIR(RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT,HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT,XCOPY.

Introduction of Internet: History of internet, Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails. (Lecture 08)

Module 3

MS Word: Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.

(Lecture 08)

Module 4

MS Excel: Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.
MS Power Point: Starting MS–Power Point,, Creating a presentation using auto content Wizard,

Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents. MS – Access: creating table and database.

(Lecture 08)

Module 5

MS-POWERPOINT: Starting MS–Power Point,, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents.

(Lecture 12)

Total lectures (12+8+8+8+12 = 48 hrs.)

Text Books:

1. Sinha P.K., Computer Fundamentals, BPB Publishing.
2. Bill Bruck., The Essentials Office 2000 Book, BPB Publishing.
3. Leon A. & Leon M., Introductions to Computers, Vikas Publications.

Reference Books:

1. Peter Norton_s, Introductions to Computers, Tata McGraw Hill.
2. Price Michael, Office in Easy Steps, TMH Publication.

Course Name: Computer Application Practical
Course Code: AECC102

Course Type: Core (Practical)	Course Details: AECC-2			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40.	----

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Computer fundamental and internet lab Practical (3×16 = 48 hrs.)

1. Using basic DOS commands.
2. Using external DOS commands
3. Creating a email account
4. Using web browser for searching and surfing.
5. Creating and formatting a document in MS office
6. Using autocorrect, auto text and spell check operation in MS office.
7. Create tables in MS Word.
8. Inserting different kinds of object in MS word.
9. Use main merger options in MS office.
10. Create an Excel work sheet with following options rows and columns alignment.
11. Using excel formulas.
12. Create a graph with available data in MS excel.
13. Create a PPT presentation using auto content wizard.
14. Use Clip art animation effects and word art galleries in presentations.
15. Using transition and setting timings for slide show.
16. Use MS access to create data base and tables.

Course Name: English Communication
Course Code: AECC103

<table>
<tr><td>Course Type:
Core (Theoretical)</td><td colspan="2">Course Details: AECC-3</td><td colspan="2">L-T-P: 3 - 0 - 0</td></tr>
<tr><td rowspan="3">Credit: 3</td><td rowspan="3">Full Marks:
100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>….</td><td>30</td><td>….</td><td>70</td></tr>
</table>

Course Learning Outcomes:

1. Students will realize the significance of English for their career progression
2. Benchmarking the students in the first semester to observe their progression in terms of LSRW
3. Students will be able to understand distinct sounds and improve pronunciation
4. Students will improve their English vocabulary of daily usage
5. Students will be able to form simple sentences to talk about themselves, friends and relatives.
6. Students will be able to imbibe the pre-requisites of personality development.

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Module -1: Introduction to English language (7 Lectures)

a) Role and significance of English language in the present scenario
b) English Language: Its relevance for the Indian industry
c) Introduction to Listening, Speaking, Reading, Writing (LSRW) and benchmarking of the class

[Note: As part of classroom activity, a guest lecture from an industry representative/Director (CRC) and maintaining progress card for each student on LSRW for future reference]

Module -2: Phonetics& Functional Grammar (7Lectures)

a) Pronunciation and daily usage correction (speak with differences between p/b, s/sh, f/ph, t/d, v/w sounds)
b) Parts of speech, articles, tenses, verbs and modals
c) Practice of daily use words, numerals and tongue twisters
d) Vocabulary building, Construction of simple sentences: Basic sentence pattern, subject and Predicate

[Note: As part of classroom activity, language games, tongue & jaw exercises, simple passages from the newspapers for oral drills in the classroom and practice tests (written and oral)]

Module -3: English Communication- About Myself (7Lectures)

a) Let's talk, making conversation, meeting and greeting
b) Introducing myself, my family and my friends
c) My opinions, my likes and dislikes
d) Life at college, hostel and workplace

[Note: As part of classroom activity, use the Work book for reference for classroom and home assignments, carry out practice tests (written and oral)]

Module -4: Basic Communication & Soft Skills (7 Lectures)

a) Reading comprehension
b) Building conversational skills
c) Verbal & Non-verbal communication

[Note: As part of classroom activity, review and recap the last semester and carry out (oral and written) practice test to update the progress card of each student, refer to the Workbook]

Module -5: Vocabulary: Building Blocks (7 Lectures)

a) Word Formation: Prefix, suffix, conversion and compounding
b) Homophones and one-word substitution
c) Words often confused and misused
d) Idiomatic phrase, Antonyms and Synonyms

[Note: As part of classroom activity, organise and learning language games, initiate the learning of 5 new words per class]

Module-6: English Communication: World around Me (6 Lectures)

a) Market place, Bus stop, Bank, Post Office
b) Village, Town and City
c) Eating out: Stall, Dhaba and Restaurant

[Note: As part of classroom activity, refer Work book for classroom and home assignments, carry out practice tests (written and oral)]

Module -7: Personality Development (7 Lectures)

a) First impression: Dressing sense, good manners, speaking well and respectably
b) Positive Attitude: Being happy and alert, a good listener and a good friend
c) Consultation among peers: Soliciting advice and giving advice
d) Goal setting, confidence building& handling rejection

[Note: As part of classroom activity, refer Work book for classroom and home assignments, carry out practice tests (written and oral)]

Total Lectures (7+7+7+7+7+6+7 = 48 hrs)

Reference Books:

ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation English Grammar Composition & Usage by J.C. Nesfield, Macmillan Publishers The Business letters by Madan Sood, Goodwill Publishing House, New Delhi Communication Skills by Sanjay Kumar &PushpLata, Oxford University Press

KAZI NAZRUL UNIVERSITY

School of Health Science and Technology Department

of Allied Health Science and Technology

UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

PROGRAM OUTLINE

Semester II

Course Code	Course Name	L - T - P	Credits	Total Marks
BMLTC201	General Biochemistry	4-0-0	4	100
BMLTC202	General Biochemistry Practical	0-0-4	2	100
BMLTC203	General Pathology and Microbiology	4-0-0	4	100
BMLTC204	General Pathology and Microbiology Practical	0-0-4	2	100
BMLTC205	Basic Hematology	3-0-2	4	100
See pool	Choose from the pool of generic elective courses offered in the second semester of allied health science disciplines other than the discipline in which degree program is taken	See pool	4	100
AEE201	Environmental Studies	4-0-0	4	100
TOTAL			**24**	**700**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Semester- II

Course Code: BMLTC201
Course Name: General Biochemistry

Course Type: Core (Theoretical)	Course Details: CC-7			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course Learning Outcome:
This syllabus has been formulated to impart the basics knowledge of understanding the chemical properties of the bio molecules, their functions and biomedical importance.

Module	Topics	No of lectures
Module 1	**Introduction to Biochemistry** Definition and importance of bio-chemistry, concept of biomolecules and cell structure.	6
Module 2	**Chemistry of Carbohydrates** Structural aspects- Introduction & Occurrence, Classification of Mono, Di and polysaccharides, Reducing and non-reducing sugars,Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function), Osazone formation, Pyranose and Furanose form.	6
Module 3	**Proteins and Amino acids**Defination, classification, essential & nonessential amino acids, Structural aspects of proteins and peptides, Transamination, Transmethylation, Urea synthesis, Urea cycle & transport, Module metabolic disorder, Creatinine, Proteinuria, creatinine clearance, General properties & tests with a few examples	6

	like glycine, trytophan, glutathione, albumin, hemoglobin, collagen	
Module 4	**Lipids** Fatty acids, saturated and unsaturated, cholesterol and triacyglycerol, phospholipids and plasma membrane, Biochemical importance, Lipoproteins in the blood composition & their relation to Atherosclerosis, Lipid profile.	4
Module 5	**Enzymes** ntroduction to enzymes, Reaction rate, thermodynamic defination, Principles of catalytic power and specificity of enzymes, overview of enzyme kinetics, Concept of Apoenzyme & Holoenzyme.	6
Module 6	**Vitamins** Fat soluble and water soluble vitamins; physiological functions and diseases of vitamin deficiency, classifications(metabolic derived/vitamin derived), General with emphasis on A, B_2, C, E and inositol (requirements, assimilation and properties).	4
Module 7	**Acid base balance fundamentals & electrolyte** pH, buffer, Acidosis, Alkalosis, sodium potassium balanace& metabolism & their clinical significance **Nucleic acid** Structural aspects- Components of DNA and RNA, Nucleotides, Double helix structure of DNA, various forms of DNA.	4
Module 8	**Bioenergetics** Basic idea of thermodynamics (Gibbs free energy, entropy, enthalpy, energy rich biological compounds.	6
Module 9	**Principle working and care of important instruments**: Balance (Analytical, electrical/electronic), Centrifuge, Colorimeter, Spectrophotometer.	6
	Total Number of Hours	**48**

Text Books:-

Biochemistry	U. Sattyanarayan
Biochemistry Laboratory Manual;	PallabBasu

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Reference Books:-

Biochemistry	Voet&Voet
Illustrated biochemistry	Harper

Course Code: BMLTC202

Course Name: General Biochemistry Practical

Course Type: Core (Practical)	Course Details: CC-8			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	Topics	No of practicals (D+P)
Module 1	Cleaning of glass ware	**4+4**
Module 2	Sterilization of glass ware	**3+3**
Module 3	Handing and Maintenance of each instrument	**4+4**
Module 4	Concept of molecular weight and equivalent weight	**2+2**
Module 5	Preparation of Normal, molar and percent solution, Dilution techniques.	**3+3**
Module 6	Simple acid base titration and calculation of normality	**2+2**
Module 7	Collection of blood-concept of Phlebotomy	**2+2**
Module 8	Separation of serum and plasma	**2+2**
Module 9	Qualitative analysisof carbohydrate, protein, fat	**2+2**
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

*** D - Demonstration & P - Practice**

Course Code: BMLTC203
Course Name: General Pathology and Microbiology

Course Type: Core (Theoretical)	Course Details: CC-9			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course Learning Outcome:
The curriculum of pathology aims at preparing the students in basic understanding of diseases and their pathogenesis. The syllabi of pathology compliments and supplements the necessary knowledge students have gained in Physiology. This subject also provides a general insight into the history, basics of microbiology and imparts knowledge about equipment used in microbiology and various microbes.

Module	Topics	No of lectures
Module 1	**Introduction to Microbiology** Definition, history, relationship of microorganisms to man	4
Module 2	**Morphology of Bacteria:** Size, Shape and arrangement of gram+ve and gram-ve bacteria cell wall,capsule,flagella and movement, bacterial endospore	4
Module 3	**Growth and Nutrition of Bacteria** A typical growth curve and bacterial nutrition assification of micro-organisms with special reference to bacteria General classification, biological classification	4
Module 4	**erilization, Antiseptics and Disinfectants** efinition, sterilization by dry heat, moist heat (below, at and above 1000oC) Autoclave, its structure and functioning, autoclave controls and sterilization indicators, Pasteurization, Serum Inspissator. Definitions, types, properties, and uses of disinfectants and antiseptics.	4

Module 5	**microscopy** structure and working of simple and compound microscope. Principles of dark field, fluorescent, phase contrast and electron microscope	4
Module 6	**training Techniques** methods of smear preparation, fixation, simple stains, grams stain, AFB staining, Albert's stain, Neisser's stain, staining of spores, capsule	6
Module 7	**culture Media** definition, Purpose, classification of culture media. Liquid and solid media, defined and synthetic media, routine laboratory media (Basal, enriched, selective, enrichment, indicator, transport and storage or preservation)	6
Module 8	**Bacterial Culture** Inoculation of culture media, aerobic and anaerobic culture, isolation ofpure cultures and disposal of cultures morphological, cultural,biochemical characteristics and laboratory diagnosis of: Staphylococci and Micrococci,Streptococci and pneumococci, Coryne bacterium diphtheria,Enterobactereacae-I (E.Coli, Klebsiella, Enterobacter), Enterobacteriaceae-II (Salmonella, Shigella, Proteus),Pseudomonas,VibrioCholerae,Neisseria, Mycobacteria, Clostridia, Treponema pallidum	4
Module 9	**Introduction of Pathology** Basic definition and medical terminology used in pathology	4
Module 10	**Cellular Adaptation, cell injury and cell death** Causes and mechanism of cell injury, reversible and irreversible injury,Necrosis, Apoptosis, Hyperplasia, Hypertropy, Atropy, Metaplasis.	4
Module 11	**Acute and Chronic inflammation**: General features of inflammation, Acute inflammation, Chronic inflammation with examples, Systemic effects of inflammation. **Tissue renewal and Repair** Healing and Fibrosis: General concept	4
	Total Number of Hours	**48**

Text Books:-

1. L Prakasamreddy, Fundamentals of Medical Physiology, 4th Edition,

Paras medical Publisher, Hyderabad,2008

2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008

Reference Books:-

1. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company, Japan

---

Course Code: BMLTC204
Course Name: General Pathology and Microbiology Practical

Course Type: Core (Practical)	Course Details: CC-10			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	Topics	No of lectures (D+P)
Module 1	Demonstration of safety rules in a microbiology laboratory	**2+2**
Module 2	Introduction to microbiological methods- Spread plate, Pour Plate	**4+4**
Module 3	To demonstrate the instruments used to seed culture media	**3+3**
Module 4	To learn techniques for Inoculation of bacteria	**2+2**
Module 5	Preparation of culture media	**2+2**
Module 6	Quality assurance & Quality control in culture media preparation.	**2+2**
Module 7	Single colony isolation after bacterial inoculation	4+4
Module 8	Aerobic and anaerobic culture methods	**2+2**
Module 9	Testing antimicrobial susceptibility of bacteria by Stoke's disc diffusion method	**3+3**
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for Bachelor of Medical Laboratory Technology.

Course Code: BMLTC205
Course Name: Basic Hematology

Course Type: **Core(Theoretical)**	Course Details: **CC-11**			L-T-P:**3-0 -1**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	**30**	….	**70**

Course Learning Outcome:
This course has been designed to understand the blood component, function of blood , its lab diagnosis and various type of laboratory test.

Module	Topics	No of lectures
Module 1	**Introduction to Blood** Introduction to blood, its composition, function and normal cellular components Definition, composition and functions of blood	6
Module 2	**Anticoagulants:** types, mode of action and preference of anticoagulants for different hematological studies	4
Module 3	**Formation of cellular components of blood (Hematopoiesis)** ● Erythropoiesis ● Leucopoiesis ● Thrombopoiesis	6
Module 4	**Collection of Blood** Collection and preservation of blood samples for various hematological investigations Collection of blood; venue and capillary Various equipment used for collection of blood samples Introduction to Blood Smear For malarial parasite (thick and thin smear)	4
Module 5	**Hemoglobin**: definition, types, structure, synthesis and degradation Normal Hemostasis & physiological properties of coagulation factors Morphology of normal blood cells	4
Module 6	**Haemoglobinometery** Types of Hemoglobin and its function Formation of Hemoglobin and its breakdown Differential Leucocyte Counting: Blood Cell Morphology in Health and Disease	4

Module 7	**Hemocytometer** Various counting chambers (Neubauer, Burker, Fuch-Rosenthal) **Methods of counting** Physiological Variation in the Normal Values of Tests HB, TLC, DLC, PCV/ESR, Platelets etc.	4
Module 8	**Quality assurance in Hematology** • Internal and external quality control including reference preparation • Routine quality assurance protocol • Statistical analysis i.e. Standard deviation, Co-efficient of variation, accuracy and precision	4
Module 9	**Basic Hematology Practical** 1. Identification of Normal blood cells. 2. Preparation of blood film. 3. Sahli's Apparatus for hemoglobin estimation 4. RBC count 5. Total count & Differential count of blood sample 6. ESR Estimation 7. Detection of Blood group(Slide method), Determination of Bleeding Time(B.T.) and Clotting Time(C.T.) of blood& Prothrombin time.	**12**
	Total Number of Hours	**48**

TEXT BOOKS:-

Medical Laboratory Technology	Kanai Lal Mukherjee
An Introduction to Medical Lab Technology	F J Baker and Silverton
Text book of Medical Laboratory Technology	P. B. Godker
Medical Laboratory Technology	K.L. Mukherjee volume III

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

PROGRAM OUTLINE

Semester III

Course Code	Course Name	L - T - P	Credits	Total Marks
BMLTC301	General Bacteriology	4-0-0	4	100
BMLTC302	General Bacteriology Practical	0-0-4	2	100
BMLTC303	Clinical Biochemistry	4-0-0	4	100
BMLTC304	Clinical Biochemistry Practical	0-0-4	2	100
BMLTC305	Fundamentals of Histology	3-0-1	4	100
BMLTC306	Fundamentals of Histopathology	3-0-1	4	100
GE 2	General Elective	See Pool.	4	100
TOTAL			**24**	**700**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Semester- III

Course Name: **General Bacteriology**
Course Code: BMLTC 301

Course Type: Core (Theoretical)	Course Details: CC-12			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course objective

This course will provide the students the basic concept of bacterial culture, staining techniques and biochemical identification methods of various bacteria.

Module	Topics	No. of Lectures
Module 1	Bacterial culture Instruments used to seed culture media Culture procedures – seeding a plate	5
Module 2	Staining techniques in bacteriology Significance of staining in bacteriology	5
Module 3	Principle, Reagent preparation, procedures and interpretation of the following Negative staining Simple stain Gram stain Albert's stain Neisser's stain Ziehl –Neelsen staining Capsule staining Flagella staining Spore staining Fontana stain for spirochetes	12
Module 4	Principle, procedures and interpretation of the following biochemical tests for identification of different bacteria Demonstration of motility	12

	Catalase Coagulase Citrate Oxidase Urease Indole Methyl Red VogesProskauer Nitrate reduction Carbohydrate fermentation Bile solubility H_2S production Nagler's reaction Cholera-red reaction ONPG test Hugh Leifson test	
Module 5	Definition, classification, various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria based on organ specific infection: Staphylococcus Streptococcus Pneumococcus Neisseria gonorrhea and Neisseria meningitis Haemophilis Enterobacteriaceae: Escherichia coli, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia enterocolitica and Yersinia pestis Vibrio, Aeromones and Plesiomonas Clostridia of wound infection Mycobacterium tuberculosis complex, Atypical Mycobacteria and M. leprae Spirochetes – Treponema, Borrellia and leptospira Bordetella and brucella Mycoplasma and Ureaplasma Rickettsia Chlamydia	14
	Total Number of Hours= 48	

Text Books:- Clinical Microbiology Made Ridiculously Simple, 6th Edition
Authors: Mark Gladwin, Bill Trattler and C. Scott Mahan

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

1. .

Reference Books:- District Laboratory Practice in Tropical Countries, Part 1, 2nd Edition
Author: Monica Cheesbrough

Course Name: **General Bacteriology-Practical**
Course Code: BMLTC302

Course Type: Core (Practical)	Course Details: CC-13			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

1. Bacterial identification: To demonstrate reagent preparation, procedure and interpretation for
- Gram stain
- Albert stain
- Z-N staining

2. To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:
- Catalase
- Indole
- Methyl Red (MR)
- VogesProskauer (VP)
- Urease
- Citrate
- Oxidase
- Glucose

- TSI

3. To demonstrate various characteristics (morphological, cultural and biochemical) of bacteria commonly isolated from clinical samples i.e.

- Staphylococcus
- Streptococcus
- Escherichia coli
- Klebsiella
- Salmonella
- Vibrio cholera
- Mycobacterium tuberculosis
- Pseudomonas
- Pneumococcus
- Clostridia
- Diphtheria

(Total lectures- 16×3=48)

*** D - Demonstration & P - Practice**

Text Books:-

The Textbook of Bacteriology-4th edition	R W Farebrother
Text book of Microbiology	Ananthanarayanan

Reference Books:-

Mannual of determinative bacteriology-9th Edition	Bergey
Practical Medical Microbiology	Mackie & McCartney

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Clinical Biochemistry**
Course Code: BMLTC303

Course Type: Core (Theoretical)	Course Details: CC-14			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Course objective

The subject will provide the basic knowledge of biochemistry, apparatus, units, equipment, and volumetric analysis in the Clinical Biochemistry

Module	Topics	Contact Hours
Module 1	Introduction to clinical Biochemistry Basic instruments in clinical biochemistry lab	4
Module 2	Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for: ● Glucose ● Proteins ● Urea ● Uric acid ● Creatinine ● Bilirubin ● Lipids	8
Module 3	Principles, procedures for estimation & assessment of the following including errors involved and their corrections ● Sodium, Potassium and Chloride, Iodine ● Calcium, Phosphorous and Phosphates	12

Module 4	● Instruments for detection of Radioactivity ● Applications of Radioisotopes in clinical biochemistry.	10
Module 5	Enzyme linked immune sorbent assay (ELISA)	4
Module 6	Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.	10
	Total Number of Hours	**48**

Course Name: **Clinical Biochemistry-Practical**
Course Code: BMLTC304

Course Type: Core (Practical)	Course Details: CC-15			L-T-P: 0 - 0 - 4	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

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

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Text Books:-

Practical Clinical Biochemistry	Harold Varley
Instrumental Analysis	Chatwal Anand
Analytical clinical biochemistry	Chandan Saha B. Chakroborty K basu

Reference Books:-

Clinical Biochemistry (Fundamentals of Biomedical Science)	Dr. Nessar Ahmed
Basic Medical Biochemistry: A clinical Approach	Michael A Lieberman

Course Name: **Fundamentals of Histology**
Course Code: BMLTC305

Course Type: **Core (Theoretical)**	Course Details: **CC-16**			L-T-P: **3- 0 - 1**	
Credit: **4**	Full Marks: **100**	CA Marks		ESE Marks	
		Practica l	Theoretical	Practical	Theoretical
		….	**30**	….	**70**

Course objective
The subject will provide the knowledge of various systems including alimentary, nervous, circulatory, endocrine and genitourinary system.

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology Department
of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Module	Topics	Contact Hours
Module 1	Alimentary System: Histological structures of different organs	6
Module 2	Circulatory System: Histological structures of blood vessels- capillary, artery, vein, cardiac tissue	7
Module 3	Nervous System: Histological structure of cerebrum, cerebellum, spinal cord	7
Module 4	Sense organs: Basic histology of eye, ear, skin, tongue	7
Module 5	Endocrine System: Histology of Pituitary, Thyroid, Adrenal, Pancreas	7
Module 6	Urinary system: Histological structure of kidney, ureter	7
Module 7	Reproductive system: Histological structure of testes and ovary, uterus	7
Total		48

Course Name: **Fundamentals of Histopathology**
Course Code: BMLTC306

<table>
<tr><td colspan="2">Course Type:
Core (Theoretical)</td><td colspan="3">Course Details: CC-17</td><td colspan="2">L-T-P: 3- 0 - 1</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks: 100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practica l</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>….</td><td>30</td><td>….</td><td>70</td></tr>
</table>

Course objective
Students will learn about various diseases associated with various system of human body and histotechniques, handling and processing of tissue specimens as well as staining procedures.

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Module	Topics	Contact Hours
Module 1	Alteration in histological structures of Alimentary System in disease condition	5
Module 2	Alteration in histological structures of Digestive System in disease condition	5
Module 3	Alteration in histological structures in genitourinary systems: nephrotic syndrome, renal failure, renal calculi, urinary obstruction, urinary tract infection, BPH, diseases of ovaries, PCOS, ectopic pregnancy	10
Module 4	Processing of various tissues for histological examination	8
Module 5	Staining, Impregnation and Mountants Types of Stains, Chemical Staining Action, Mordants and Accentuators, Metachromasia	10
Module 6	Routine Staining Procedures Hematoxylin and Eosin Staining, various types of Hematoxylin Mallory's Phosphotungstic Acid Haematoxylin (PTAH), PAS stain	10
	Total Number of Hours	48

Fundamentals of Histopathology-Practical

- To practice attachment of tissue sections to glass slides
- To perform & practice the Hematoxylin and Eosin staining technique
- To perform & practice the PAS staining

Text Books

Handbook of Histopathological Techniques	C F A Culling
An Introduction to Medical Lab Technology	F J Baker and Silverton

Reference Book:

Bancroft's Theory and Practice of Histopathological Techniques	John D Bancroft
Medical Lab technology	Lynch

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Program outline

Semester IV

Course Code	**Course Name**	L - T - P	Credits	Total Marks
BMLTC401	Immunology & Bacterial Serology	4-0-0	4	100
BMLTC402	Immunology & Bacterial Serology-Practical	0-0-4	2	100
BMLTC403	Applied Histology	4-0-0	4	100
BMLTC404	Applied Histology-Practical	0-0-4	2	100
BMLTC405	Applied Clinical Biochemistry	4-0-0	4	100
BMLTC406	Applied Clinical Biochemistry-Practical	0-0-4	2	100
BMLTC407	Basic Nutrition & Public Health	3-0-1	4	100
See pool	General Elective	See pool	4	100
Total			26	800

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Immunology & Bacterial Serology**

Course Code: BMLTC401

Course Type: Core (Theoretical)	Course Details: CC-18			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Microbiology

Course objective
This ofurse has been formulated to impart basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis, of human diseases.

Module	**Topics**	**No of Lectures**
Module 1	History and introduction to immunology Immunity ● Innate ● Acquired immunity	6
Module 2	Antigen-Antibody reactions Definition Classification General features and mechanisms Applications of various antigen antibody reactions	6
Module 3	Principle, procedure and applications of the following in Medical Microbiology: Complement fixation test Immuno- fluorescence ELISA SDS-PAGE Western blotting	8
Module 4	Principle & Application of various serological tests: ● Widal ● VDRL ● CRP	8
Module 5	Immune response: ● Introduction ● Basic concepts of Humoral and Cellular immune responses	8
Module 6	Hypersensitivity: ● Definition ● Types of hypersensitivity reactions	4

Module 7	Basic concepts of autoimmunity and brief knowledge about autoimmune diseases	4
Module 8	Automation in diagnostic serology Vaccines: ● Definition ● Types ● Brief knowledge about _Extended programme of immunization'(EPI) in India-Adult & Pediatric	4
	Total Number of Hours	**48**

Course Name: **Immunology & Bacterial Serology-Practical (Hospital Oriented)**
Course Code: BMLTC402

Course Type: Core (Practical)	Course Details: CC-19			L-T-P: 0 - 0 - 4	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	**Topics**	**No of Lectures (D+P)**
Module 1	Preparation of Phosphate buffers, Phosphate Buffer, TRIS buffer, MES buffer, Citrate buffer buffers of different pH and Morality, Determination of cell concentration by Spectrophotometer	**12+12**
Module 2	Performance of Serological tests i.e. ● Widal ● VDRL (including Antigen Preparation), ● ASO (Anti-Streptolysin _O') ● C-Reactive Protein (Latex agglutination) ● Rheumatoid factor (RF) Latex agglutination	**6+6**
Module 3	Demonstration of antigen/antibody determination by Immuno fluorescence (IF), Immuno diffusion, precipitation in Agarose gel (ODD), CCIEP, ELISA, SDS - PAGE and Western blotting.	**9+9**
	Total Number of Hours	**48**

***D= Demonstration, P= Practical**

Text Book

Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.	Abbas AK, Lichtman AH, Pillai S.
Essential Immunology.11th edition	Delves P, Martin S, Burton D, Roitt IM. (2006).

Reference Book

Kuby's Immunology. 6th edition W.H. Freeman and Company, New York	Goldsby RA, Kindt TJ, Osborne BA. (2007)
Janeway's Immuno biology	Murphy K, Travers P, Walport M. (2008)

Course Name: **Applied Histology**

Course Code: BMLTC403

Course Type: Core (Theoretical)	Course Details: CC-20			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite- Knowledge in Basic Histology

Course objective

The subject will provide students knowledge on cryostat sectioning, staining procedures to observe important biomolecules and microbes in frozen sections, and concept on vital staining and electron microscope.

Module	Topics	No of Lectures
Module 1	Cryostat sectioning, its applications in diagnostic histopathology.	4
Module 2	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. ● Demonstration and identification of minerals and pigments, removal of Pigments/artifacts in tissue sections	6
Module 3	Demonstration of Proteins & nucleic acids. Demonstration of Carbohydrates, lipids, fat & fat like substances.	4

Module 4	Demonstration of bacteria and fungi in tissue section	4
Module 5	Tissue requiring special treatment i.e. eye ball, bone marrow, and muscle biopsy, under calcified or unclarified bones, whole brain, and whole lungs including other large organs.	4
Module 6	Enzyme histochemistry: Diagnostic applications and the demonstration of Phosphatases,Dehydrogenases, Oxidases & Peroxidases. Overview of Immuno-histochemistry	4
Module 7	Vital staining.	4
Module 8	Neuro-pathological techniques.	6
	Micrometry and Morphometry- Museum techniques.	6
Module 9	Electron Microscope: working principle and its components Processing, embedding and ultra-microtomy	6
	Total Number of Hours	**48**

Course Name: **Applied Histology- Practical**
Course Code: BMLTC404

Course Type: Core (Practical)	Course Details: CC-21			L-T-P: 0 - 0 - 4	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	**Topics**	**Lectures (D+P)**
Module 1	To demonstrate cutting of paraffin embedded tissue sections and subsequent staining for histological studies.	6+6
Module 2	To demonstrate the presence of bacteria and fungi in paraffin embedded sections using the following staining procedures: ● Gram's staining ● AFB staining (Ziehl Neilson's staining) for M. tuberculosis and leprae ● Schmorl's reaction for reducing substances (melanin)	6+6
Module 3	To demonstrate the stain for nucleic acid (DNA and RNA) ● Feulgen Staining ● Methyl Green-Pyronin Staining ● Enzymatic methods	6+6
Module 4	To demonstrate staining of fat using Toluidine blue- O and Oil Red-O.	6+6
	Total Number of Hours	**48**

***D= Demonstration, P= Practical**

Text Book

Medical Laboratory Technology Volume III	KL Mukherjee
Atlas of Histology	Di Fiore

Reference Book

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Theory and Practice of Histological Techniques	John D Bancroft

Course Name: **Applied Clinical Biochemistry**
Course Code: BMLTC405

Course Type: Core (Theoretical)	Course Details: CC-22			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Pass in Biochemistry
Course objective: The subject will provide the knowledge on various tolerance and clearence test of various bimolecular and CSF molecules

Module	**Topics**	**No of Lectures**
Module 1	Automation in clinical biochemistry Method of estimation and assessment for: Glucose tolerance test Insulin tolerance test Xylose excretion test	10
Module 2	Clearance test for renal function. ● Qualitative test for: ● Urobilinogens ● Barbiturates ● T3, T4 and TSH ● Ketosteroids	10
Module 3	Enzymes Principles Clinical significance	10
Module 4	Procedures for estimation ● Acid phosphatase ● Alkaline phosphatase ● Lactate dehydrogenase ● Aspartate transaminase ● Alanine transaminase ● Creatine phosphokinase	10
Module 5	Chemical examination of Cerebrospinal fluid.	4
Module 6	Brief knowledge about rapid techniques in clinical biochemistry	4
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Applied Clinical Biochemistry practical**
Course Code: BMLTC406

Course Type: Core (Practical)	Course Details: CC-23			L-T-P: 0 - 0 - 4	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	**Topics**	**No of practical (D+P)**
Module 1	1. Estimation of Glucose tolerance test (GTT).	4+4
Module 2	Determination of Uric acid in Urine.	4+4
Module 3	Determination of Creatinine clearance.	4+4
Module 4	Determination of Urea clearance.	4+4
Module 5	Determination of Serum acid phosphatase.	2+2
Module 6	Determination of Serum Alkaline phosphatase.	2+2
Module 7	. Determination of Serum Lactate dehydrogenase.	2+2
Module 8	Determination of T3, T4 and TSH	2+2
	Total Number of Hours	**48**

*D= Demonstration, P= Practical

Text Book

Practical Clinical Biochemistry	Harold Varley
Text book of Medical Biochemistry	Chatterjee, Shinde

Reference Book

Principal of Biochemistry	Lehninger
Text book of Medical Laboratory Technology	P. B. Godker

Course Name: **Basic Nutrition & Public Health**
Course Code: BMLTC407

Course Type: Core (Theoretical)	Course Details: CC-24			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Pre-requisite: Basic Biology in 10+2

Course objective: The subject will provide the basic knowledge Scientific Nutrition that covers the areas of foods and nutrition from a scientific approach. Studies prepare students for many science, dietetics, food industry, and health-related careers. Producing, processing, preparing, evaluating, and using food are all aspects of this field. It also covers many topics on various nutritional deficiency, nutritional program and educational investigation

Module	Topics	No of Lectures
Module 1	Nutrition, Malnutrition and Health. Scope of Nutrition. Formulation of RDA dietary guidelines with reference to man and woman	8
Module 2	Community water and its management: Source of water, safe drinking water, etiology and effects of toxic agents, water borne disease : Cholera and Amoebiasis), sewage disposal and treatment.	6
Module 3	● Microbiological examination of water and milk. ● Importance of sanitation and hygiene in foods, kitchen hygiene, food plant hygiene.	8
Module 4	Nutritional problems in community: Malnutrition, deficiency of Vitamin A and Vitamin D	8
Module 5	Study of Clinical signs: Identifying signs of PEM, Vit A, Vit B complex, Vit D, Vit C deficiency, Iron and Iodine deficiency	8
Module 6	Nutrition studies of children and Nutritional education.	4
Module 7	National Nutritional Intervention Programme to combat malnutrition: ICDS, Midday meal, PHC and Public distribution system	6
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Program outline

Semester V

Course Code	Course Name	L - T - P	Credits	Total Marks
BMLTC501	Medical Parasitology and Entomology	4-0-0	4	100
BMLTC502	Cytopathology	4-0-0	4	100
BMLTC503	Medical Mycology and Virology	4-0-0	4	100
BMLTC504	Immunopathology	4-0-0	4	100
BMLTC505	Clincial Posting	0-0-8	4	100
BMLTSE501	Research Methodology and Bio-statistics	3-1-0	4	100
See pool	General Elective	See pool	4	100
Total			**28**	**700**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Medical Parasitology & Entomology**

Course Code: BMLTC501

Course Type: Core (Theoretical)	Course Details: CC-25			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Microbiology & Immunology

Course objective
This paper aims to learn about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites.

Module	Topics	No of Lectures
Module 1	Introduction to Medical Parasitology with respect to terms used in Parasitology	4
Module 2	Protozoology/ Protozoal parasites: ● General characteristics of protozoa. ● Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp. ● Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp. ● Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp.	8
Module 3	Helminthology/ Helminthic parasites: General characteristics of Cestodes, Trematodes and Nematodes Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of : ● Taeniasolium and saginata ● Echinococcusgranulosus ● Hymenolepis nana ● Schistosoma haematobium and mansoni ● Fasciola hepatica and buski ● Trichuristrichura	6

	• Trichinellaspirales • Strongyloidesstercoralis • Ancylostomaduodenale • Enterobiusvermicularis • Ascarislumbricoides • Wuchereriabancrofti • Dracunculusmedinensis	
Module 4	Examination of Stool for parasites • For intestinal protozoal infections • General rules for microscopic examination of stool samples • Collection of stool samples • Preparation of material for unstained and stained preparations • Staining methods i.e. Iodine staining and permanent staining • For Helminthic infections	6
Module 5	Examination of blood for parasites • Preparation of thin and thick blood film • Leishman staining • Examination of thick and thin smear • Field's stain • JSB stain	6
Module 6	Examination of blood film for Malarial parasite and Microfilariae	4
Module 7	Collection, Transport, processing and preservation of samples for routine parasitological investigations	6
Module 8	Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms Morphology, life cycle and lab-diagnosis of T. solium and T. saginata Morphology, life cycle and lab-diagnosis of Malarial parasite with special reference to P.vivax and P. falciparum	6
Module 9	Laboratory diagnosis of hydated cyst and cysticercosis Concentration techniques for demonstration of Ova and Cysts (Principles and applications)	2
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Cytopathology**
Course Code: BMLTC502

Course Type: Core (Theoretical)	Course Details: CC-26			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Pathology

Course objective
The students will learn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens.

Module	Topics	No of lectures
Module 1	Cryostat sectioning, its applications in diagnostic cytopathology	6
Module 2	Enzyme Cytochemistry: ● Diagnostic applications ● Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases	6
Module 3	Aspiration cytology: ● Principle ● Indications & utility of the technique with special emphasis on role of ● cytotechnologist in FNAC clinics	8
Module 4	Exfoliative cytology (Papanicolaou technique for the staining of cervical smears) ● Cervical cytology ● Fluid Cytology ● Urine ● CSF ● Body Fluids (Pleural, Pericardial, Ascitic)	8
Module 5	Automation in cytology	10
Module 6	Liquid based cytology: Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry	10
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Medical Mycology & Virology**

Course Code: BMLTC503

Course Type: Core (Theoretical)	Course Details: CC-27			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Microbiology

Course objective

The subject will provide the knowledge regarding fungus and its associated disorders, the morphological characteristics of various fungi, culture technique and their identification method. The course on virology will provide the students basic structure, unique characteristics, culture method and various viral disorders.

Module	Topics	No. of lectures
Module 1	Introduction to Medical Mycology Basic concepts about superficial and deep Mycoses	6
Module 2	Classification of Fungi-Normal and medically important fungi	4
Module 3	Morphological, cultural characteristics of common fungal laboratory contaminants Culture media used in mycology Direct microscopy in Medical mycology laboratory	4
Module 4	Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids Techniques used for isolation and identification of medically important fungi	6
Module 5	Methods for identification of yeasts and moulds Special emphasis to: Candida, Cryptococcus, Aspergillus, Histoplasma, Dimorphism in fungi Brief overview of mycetoma	4
Module 6	Introduction to medical virology Introduction to medically important viruse	4
Module 7	Structure and Classification of viruses. Multiplication of viruses	4
Module 8	Collection, transportation and storage of sample for viral diagnosis Staining techniques used in Virology Processing of samples for viral culture (Egg inoculation and tissue culture)	8

Module 9	Rapid diagnosis of viral infections with special reference to HIV, HBV and HCV ● EIA ● Immunofluorescence ● PCR	8
	Total Number of Hours	**48**

Course Name: **Immunopathology**

Course Code: BMLTC504

Course Type: Core (Theoretical)	Course Details: CC-28			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Basic Immunology and Pathology

Course objective:

The course will provide the students idea of human immune system, genetics of the immune cells, various immunopathological conditions, HLA typing, immunotolerance, malignancy.

Module	Topics	No of lectures
Module 1	Anatomy & Physiology of the Immune System	8
Module 2	Immunogenetics , Resistance, Immunity & Vaccines	6
	Immune tolerance : Basic concepts Immunodeficiencies Immunology of AIDS	6
Module 3	Immunopathology Type I: Allergy/Parasite Immunity Immunopathology Type II: Autoimmunity	6
Module 4	Immunopathology Type III: Immune Complex Disease Immunopathology Type IV: T Cell Mediated	6
Module 5	Tumor Pathology & Immunology,	6
Module 6	Lymphoid Malignancies & New Ideas	4
Module 7	● MHC I & II ● HLA Typing & Cross matching ● Transplant Immunology	4
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Text Book

Basic & Clinical Immunology	P. Daniel Fudenberg. H. Hugh and Stites
Immunology	Riot

Reference Book

Immunology	Kuby

Course Name: **Clinical posting**
Course Code: BMLTC505

Course Type: Core (Practical)	Course Details: CC-29			L-T-P: 0 - 0 - 8	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Course Name: **Research Methodology and Biostatistics**

Course Code: BMLTSE501

Course Type: Core (Theoretical)	Course Details: SEC-1			L-T-P: 3 - 1 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Mathematics in 10+2.

Course objective
The subject will induce the students the basic idea of research methodology and associated ethical concern, sampling method, data collection and proper statistical analysis of collected data.

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Module	Topics	No of lectures
Module 1	Introduction to research methods	4
Module 2	Identifying research problem	4
Module 3	Ethical issues in research	4
Module 4	Research design	4
Module 5	Basic Concept of Bio-statistics Need of biostatistics	4
Module 6	Types of Data Research tools and Data collection methods Documentation of collected data	4
Module 7	Sampling methods	4
Module 8	Developing a research proposal	4
Module 9	Understanding data in biostatistics How to get relevant data	4
Module 10	Relation between data & variables Type of variables: defining data set	4
Module 11	Collection of relevant data: sampling methods Construction of study: population, sample, normality etc.	4
Module 12	Summarizing data on the pretext of underlined study Significance of statistical analysis	4
	Total Number of Hours	**48**

Text Book

Methods in Biostatistics for Medical students and research workers-7th Ed.	B. K. Mahajan
Reference Book	
Introduction to Biostatistics	Ornaldo Wayne

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Program outline

Semester VI

Course Code	Course Name	L - T - P	Credits	Total Marks
BMLTC601	Blood Banking and Blood Transfusion	4-0-0	4	100
BMLTC602	Blood Banking and Blood Transfusion Practical	0-0-4	2	100
BMLTC603	Genetics and Molecular Biology	4-0-0	4	100
BMLTC604	Genetics and Molecular Biology Practical	0-0-4	2	100
BMLTC605	Special Techniques in Laboratory Science	4-0-0	4	100
BMLTC606	Special Techniques in Laboratory Science Practical	0-0-4	2	100
BMLTC607	Clinical Posting	0-0-8	4	100
BMLTSE601	Medical Law and Ethics	3-1-0	4	100
Total			26	800

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Blood Banking & Blood Transfusion**

Course Code: BMLTC601

Course Type: Core (Theoretical)	Course Details: CC-30			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Basic knowledge of Hematology

Course objective

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.

Module	Topics	No of lectures
Module 1	History and discovery of various blood group systems ABO blood group system Rh and other major blood group system	4
Module 2	ABO grouping: Forward and reverse grouping. Causes of discrimination between forward and reverse grouping Sources of error in blood grouping and their elimination	4
Module 3	Introduction to Blood Banking Compatibility test in blood transfusion ● Collection of blood for cross matching from a blood bag ● Major cross matching ● Minor cross matching ● Use of enzymes in blood bank specially Papain	6
Module 4	Complications and hazards of blood transfusion ● Sterility Testing ● Screening before blood transfusion Laboratory investigations of transfusion reactions and mismatched blood transfusion.	6
Module 5	Precautions while procurement and storage of grouping antisera	4
Module 6	Various anticoagulants used to collect blood for transfusion purposes Selection of donor and procedure for collection of blood from a healthy donor	6

Module 7	Preparation of various fractions of blood for transfusion and therapeutic purposes such as: ● Packed red cells, washed red cells and FROZEN Red cells ● Platelet Rich Plasma (PRP), Platelet concentrate and frozen platelets. ● Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate	8
Module 8	Brief introduction of blood substitute/artificial blood	5
Module 9	Quality control in blood bank & blood transfusion	5
	Total Number of Hours	**48**

Course Name: Blood Banking & Blood Transfusion-Practical
Course Code: BMLTC602

Course Type: Core (Practical)	Course Details: CC-31		L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	Topics	No of Practical (D+P)
Module 1	To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions	4+4
Module 2	Screening of blood donor: physical examination including medical history of the donor	4+4
Module 3	Collection and preservation of blood for transfusion purpose	3+3
Module 4	Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV	3+3
Module 5	To determine the ABO & Rh grouping ● Direct or preliminary grouping ● Indirect or proof grouping ● Rh grouping and determination of Du in case of Rh negative	3+3
Module 6	To perform Direct and Indirect Coomb's test	3+3
Module 7	Preparation of various fractions of blood.	4+4
	Total Number of Hours	**48**

***D= Demonstration, P=Practical**
Text Book

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Clinical Hematology,(2014),13th edition	Lippincott Williams & Wilkins
Modern Blood Banking And Transfusion Practices	Denise M. Harmening

Reference Book

Handbook Of Blood Banking & Transfusion Medicine	Gundu H R Rao

Course Name: **Genetics & Molecular Biology**
Course Code: BMLTC603

Course Type: Core (Theoretical)	Course Details: CC-32			L-T-P: 4 - 0 - 0
Credit: 4	Full Marks: 100	CA Marks		ESE Marks
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in biology 10+2
Course objective
This course will provide preliminary concept of heredity, chromosomal basis of inheritance, microbial genetics, human genetics and molecular genetics.

Module	Topics	No of lectures
Module 1	Continuity of life-heredity, variation Mendel's laws of inheritance,	5
Module 2	Chromosomal basis of inheritance; other patterns of inheritance- incomplete dominance, multi parallelism, quantitative inheritance.	5
Module 3	Concept of genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination	6
Module 4	Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids	6
Module 5	Microbial genetic	6
Module 6	Human Genetics	6
Module 7	Introduction to Molecular Biology Relationship of Molecular Biology with other Science	6
Module 8	Molecular Biology Techniques : Principle, Reagents used, procedure and applications in Medical diagnostics Polymerase Chain Reaction and its advanced versions Gel electrophoresis Western blotting	4

Module 9	Chemical composition of DNA DNA replication DNA damage and repair Cell cycle	4
	Total Number of Hours	**48**

Course Name: Genetics & Molecular Biology-Practical

Course Code: BMLTC604

Course Type: Core (Practical)	Course Details: CC-33			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	Topics	No of Practical (D+P)
Module 1	Isolation of DNA and RNA	3+4
Module 2	Estimation of DNA and RNA	3+4
Module 3	Polymerase Chain Reaction	3+4
Module 4	Gel electrophoresis	3+4
Module 5	Determination of molecular weight and quantification of DNA using agarose gel electrophoresis	3+4
Module 6	Western blotting	3+4
Module 7	ELISA for laboratory diagnosis of AIDS	3+3
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Special Techniques in Laboratory Science**
Course Code: BMLTC605

Course Type: Core (Theoretical)	Course Details: CC-34			L-T-P: 4 - 0 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

Pre-requisite: Knowledge in Biochemistry & Molecular Biology

Course objective:
The course will aim to acquaint the students the knowledge of various techniques used for diagnostics pathology, molecular biology and biochemistry.

Module	Topics	No of lectures
Module 1	Chromatography, its principle, types and applications. Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography,Ion exchange chromatography and their application in diagnosis	10
Module 2	Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.	10
Module 3	Centrifugation, fixed angle and swinging bucket rotors , RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation andUltracentrifugation	10
Module 4	Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry	10
Module 5	Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.	8
	Total Number of Hours	**48**

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology
Course Name: **Special Techniques in Laboratory Science -Practical**
Course Code: BMLTC606

Course Type: Core (Practical)	Course Details: CC-35			L-T-P: 0 - 0 - 4	
Credit: 2	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Module	Topics	No of Practical (D+P)
Module 1	To perform separation of amino acids by paper chromatography	3+3
Module 2	To perform separation of amino acids by thin layer chromatography To perform separation of DNA by Agarose gel electrophoresis.	3+3
Module 3	Separation of protein byPAGE	3+3
Module 4	Separation of protein bypaper electrophoresis	3+3
Module 5	Separation of haemoglobin	3+3
Module 6	To perform Dengue IgG & IgM test	3+3
Module 7	To perform Typhoid test.	3+3
Module 8	Microscopic examination of urine	3+3
	Total Number of Hours	**48**

*D= Demonstration, P= Practical

Text Book	
Manual of Medical Laboratory Techniques	S . Ramakrishnan, K. N Sulochana
Reference Book	
Clinical Diagnosis and Management by Laboratory Methods	Henry

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Clinical posting**
Course Code: BMLTC607

Course Type: Core (Practical)	Course Details: CC-36			L-T-P: 0 - 0 - 8	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	----	40	----

Course Name: **Medical laws and ethics**

Course Code: BMLSEC601

Course Type: Core (Theoretical)	Course Details:SEC-2			L-T-P: 3 - 1 - 0	
Credit: 4	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		….	30	….	70

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Program outline

Semester VII

Course Code	Course Name	L - T - P	Credits	Total Marks
BMLTC701	Internship -I	0-0-12	6	100
BMLTC702	Project Work -I	0-0- 6	3	100
Total			9	200

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Internship-I**

Course Code: BMLTC701

Course Type: Core (Theoretical)	Course Details: CC-37			L-T-P: 0 - 0 - 12	
Credit: 6	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	….	40	….

Course Name: **Project work I**

Course Code: BMLTC702

Course Type: Core (Theoretical)	Course Details: CC-38			L-T-P: 0 - 0 - 6	
Credit: 3	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	….	40	….

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Program outline

Semester VIII

Course Code	**Course Name**	L - T - P	Credits	Total Marks
BMLTC801	Internship -I	0-0-12	6	100
BMLTC802	Project Work -I	0-0- 6	3	100
Total			9	200

KAZI NAZRUL UNIVERSITY
School of Health Science and Technology
Department of Allied Health Science and Technology
UG Learning Outcome Based Curriculum (LOCF) for B.Sc in Medical Laboratory Technology

Course Name: **Internship-II**

Course Code: BMLTC801

Course Type: Core (Theoretical)	Course Details: CC-39			L-T-P: 0 - 0 - 12	
Credit: 6	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	….	40	….

Course Name: **Project work II**

Course Code: BMLTC802

Course Type: Core (Theoretical)	Course Details: CC-40			L-T-P: 0 - 0 - 6	
Credit: 3	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		60	….	40	….