SYLLABUS

FOR

M.Sc. MEDICAL Microbiology (SEMESTER I)

(Under Choice based Credit System)

Examinations: 2021 Onwards

Board of Studies of Medical Laboratory Technology & Sciences

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY KAPURTHALA

Note:

(i) Subject to change in the syllabi at any time. Please visit the University website time to time.

IK Gujral Punjab Technical University

VISION

To be an institution of excellence in the domain of higher technical education that serves as the fountainhead for nurturing the future leaders of technology and techno- innovation responsible for the techno-economic, social, cultural and environmental prosperity of the people of the State of Punjab, the Nation and the World.

MISSION

To provide seamless education through the pioneering use of technology, in partnership with industry and society with a view to promote research, discovery and entrepreneurship and
To prepare its students to be responsible citizens of the world and the leaders of technology and techno-innovation of the 21st Century by developing in them the desirable knowledge, skill and attitudes base for the world of work and by instilling in them a culture for seamlessness in all facets of life.

OBJECTIVES

- To offer globally-relevant, industry-linked, research-focused, technology- enabled seamless education at the graduate, postgraduate and research levels in various areas of engineering & technology and applied sciences keeping in mind that the manpower so spawned is excellent in quality, is relevant to the global technological needs, is motivated to give its best and is committed to the growth of the Nation;
- To foster the creation of new and relevant technologies and to transfer them to industry for effective utilization;
- To participate in the planning and solving of engineering and managerial problems of relevance to global industry and to society at large by conducting basic and applied research in the areas of technologies. To develop and conduct continuing education programmes for practicing engineers and managers with a view to update their fundamental knowledge base and problem-solving capabilities in the various areas of core competence of the University;
- To develop strong collaborative and cooperative links with private and public sector industries and government user departments through various avenues such as undertaking

of consultancy projects, conducting of collaborative applied research projects, manpower development programmes in cutting-edge areas of technology, etc;

- To develop comprehensive linkages with premier academic and research institutions within the country and abroad for mutual benefit;
- To provide leadership in laboratory planning and in the development of instructional resource material in the conventional as well as in the audio- visual, the video and computer-based modes;
- To develop programmes for faculty growth and development both for its own faculty as well as for the faculty of other engineering and technology institutions;
- To anticipate the global technological needs and to plan and prepare to cater to them;
- To interact and participate with the community/society at large with a view to inculcate in them a feel for scientific and technological thought and endeavour; and
- To actively participate in the technological development of the State of Punjab through the undertaking of community development programmes including training and education programmes catering to the needs of the unorganized sector as well as that of the economically and socially weaker sections of society.

ACADEMIC PHILOSOPHY

The philosophy of the education to be imparted at the University is to awaken the **"deepest potential"** of its students as holistic human beings by nurturing qualities of self-confidence, courage, integrity, maturity, versatility of mind as well as a capacity to face the challenges of tomorrow so as to enable them to serve humanity and its highest values in the best possible way.

TITLE OF THE PROGRAM: M.Sc. MEDICAL Microbiology

YEAR OF IMPLIMENTATION: New Syllabus will be implemented from October, 2021 onwards.

DURATION: The course shall be two years, with semester system (4 semesters, with two semesters in a year). The Choice based credit system will be applicable to all the semesters.

ELGIBILITY FOR ADMISSION: Candidates with 50% marks (5% relaxation for reserved categories) in Bachelors Degree in Medical/B.Sc. (Hons.) in Microbiology/ B.Sc. MLT are eligible for admission to this course.

INTAKE CAPACITY: 30 (Thirty)
MEDIUM OF INSTRUCTION: English.

SCHEME OF THE PROGRAM: Semester-I

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L*	T*	P	Internal	External		
MMB-101-21	Core theory	Human Anatomy and Physiology	3	1	--	30	70	100	4
MMB-102-21	Core theory	Clinical Microbiology	3	1	0	30	70	100	4
MMB-103-21	Core theory	Clinical Biochemistry	3	1	0	30	70	100	4
MMB-104-21	Core theory	Immunology	3	1	0	30	70	100	4
MMB-105-21	Core Practical/Laboratory	Human Anatomy and Physiology Lab	0	0	6	25	50	75	3
MMB-106-21	Core practical/ laboratory	Clinical Microbiology Lab	0	0	6	25	50	75	3
MMB-107-21	Core practical/ laboratory	Clinical Biochemistry Lab	0	0	6	25	50	75	3
MMB-108-21	Elective practical	Seminar/Presentations	0	0	1	-	-	25	1
	TOTAL					195	430	650	26

EXAMINATION AND EVALUATION

THEORY				
S.No.		Weightage in Marks		Remarks
1	Mid-Semester Examination	20	15	MSTs, Quizzes, assignments, attendance, etc. Constitute internal evaluation. Average of two mid-semester exams will be considered for evaluation
2	Attendance	5	5	
3	Assignments	5	5	
4	End-Semester Examination	70	50	Conduct and checking of the answer sheets will be at the department level in case of university teaching department of Autonomous institutions. For affiliated colleges examination will be conducted at the university level
	Total	**100**	**75**	
PRACTICAL				
1	Daily evaluation of practical performance/ record/ viva voce	30		Internal Evaluation
2	Attendance	5		
3	Internal Practical Examination	15		
4	Final Practical Examination	25		External Evaluation
	Total	**75**		

PATTERN OF END-SEMESTER EXAMINATION

I. **Part A** will be One Compulsory question consisting of short answer type questions [Q No. 1(a-j)] covering whole syllabus. There will be no choice in this question. It will be of 20 marks comprising of **10 questions of 2 marks each**.

II. **Part B** will be comprising of eight questions [2-9]. Student will have to attempt any six questions from this part. It will be of 30 marks with **6 questions of 5 marks each**.

III. **Part C** will be comprising of two compulsory questions with internal choice in both these questions [10-11]. It will be of 20 marks with **2 questions of 10 marks each**.

SYLLABUS OF THE PROGRAM

The syllabus has been upgraded as per provision of the UGC module and demand of the academic environment. The contents of the syllabus have been duly arranged unit wise and included in such a manner so that due importance is given to requisite intellectual and laboratory skills. The application part of the respective contents has been appropriately emphasized.

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 101-21**			
Subject Title	**Human Anatomy & Physiology**			
Contact Hours	**L:4**	**T:0**	**P:0**	**Credits:4**
Examination Duration (Hrs)	**3**			
Objective	**To teach basic concepts of Human Anatomy & Physiology**			

Course Contents

UNIT	CONTENTS	HOURS
I	**INTODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY** Structural organisation of human body, homeostasis, directional and regional terms of human anatomy and physiology, body planes, cavities and regions. **DIGESTIVE SYSTEM** Structure and functions of the organs of digestive system, gastrintestinal glands, enzymes of digestive system, mechanism of digestion in gastrointestinal/digestive system **RESPIRATORY SYSTEM** Structure and functions of respiratory organs, respiratory volumes and capacities, mechanism of breathing and exchange of gases	15
II	**CARDIOVASCULAR SYSTEM** Blood composition, structure and function of heart and major blood vessels of human body, blood circulation pathway, pulmonary circulation, general and systematic circulation, conductive system of heart, cardiac cycle, ECG **ENDOCRINE SYSTEM** Location of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, hypothalamus, pancreatic iselets, pineal and thymus gland, structure and function of all human glands.	12
III	**MUSCULAR SYSTEM** Structure of different types of muscles in human body, mechanism of muscle contraction, neuromuscular transmission **SKELETAL SYSTEM** Classification, structure and function of human skeletal system, microanatomical and gross structureof a bone, tupes and developments of bones, movement and types of bone joints in human body	12
IV	**NERVOUS SYSTEM** Location of brain and spinal cord, structure and function of brain and spinal cord, details of central nervous system, peripheral nervous system and autonomous nervous system, structure of neuron, synapse,transmission and conduction of nerve impulse **URINOGENITAL SYSTEM** Structure and functions of organs of urinary system, structure and function of nephron, mechanism of urine formation, micturition, structure and function of male and female reproductive system, menstrual cycle, infertility and menopause, fertulisation and embryogenesis	15

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 102-21**			
Subject Title	**Clinical Biochemistry**			
Contact Hours	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (Hrs)	**3**			
Objective	**To teach basic concepts of Clinical Biochemistry**			

Details of the Course

UNIT	CONTENTS	HOURS
I	**INTRODUCTION TO BIOMOLECULES** Introduction to carbohydrates, proteins and lipids and their functions, metabolic reactions of carbohydrates, lipids and proteins	8
II	**LIVER FUNCTION TESTS** Introduction and functions of liver, metabolic and excretory functions, protection and detoxification, liver profile test: serum bilirubin and VD Bergh reaction, serum transaminases, alkaline phosphatase, gamma-glutamyl transferase, principle and clinical importance of liver markers **KIDNEY FUCTION TESTS** Introduction and function of kidney, excretory and reabsorptive functions, regulatory functions, urine formation, diseases of kidney, kidney profile test: blood urea nitrogen, serum creatinine, total protein, albumins, globulins, A/G ratio, clearance tests, urine examination	12
III	**MALNUTRITIONAL DISORDERS** Marasmus, kwashiorkor, nutritional deficiency of vitamins & minerals, prescribed diet, hyper vitaminosis and hypo vitaminosis **CANCER** Etiology of cancer, biochemical changes of cancer, role of oncogenes, apoptosis, biochemical basis of metastasis	12
IV	**BIOCHEMICAL CHANGES AND DISEASES** Biochemistry of diabetes mellitus, fatty liver and biochemical changes, atherosclerosis and biochemical changes **INBORN ERRORS BY BIOCHEMICAL METABOLISM** Inborn errors of carbohydrate metabolism: glycogen storage disease, essential pentosuria, fructosuria, galactosemia, inborn errors of protein and amino acid metabolism: phenyl ketonuria, alkeptonuria, albinism, cystinuria, hypertyrosinemias, homocystinuria, inborn errors of lipid metabolism: Gaucher's disease, Fabry's disease, Taysach's disease, Niemann pick disease	12

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	CHATTERJEA M N AND SHINDE RANA	TEXTBOOK OF MEDICAL BIOCHEMISTRY	JAYPEE BROTHERS MEDICAL PUBLISHERS PVT. LTD
2	GODKAR P.B AND GODKAR D.P,	TEXTBOOK OF MEDICAL BIOCHEMISTRY	BHALANI PUBLISHING HOUSE
3.	DEVLIN, T.M.	TEXTBOOK OF BIOCHEMISTRY WITH CLINICAL CORRELATIONS	JOHN WILEY & SONS, INC. (NEW YORK),
4.	NELSON, D.L. AND COX, M.M	LEHNINGER: PRINCIPLES OF BIOCHEMISTRY	W.H. FREEMAN AND COMPANY (NEW YORK)

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 103-21**			
Subject Title	**Clinical Microbiology**			
Contact Hours	**L:4**	**T:0**	**P:0**	**Credits:4**
Examination Duration (Hrs)	**3**			
Objective	**To teach basic concepts of Clinical Microbiology**			

Details of the Course

UNIT	CONTENTS	HOURS
I	**INTRODUCTION, HISTORY & SCOPE OF MICROBIOLOGY** Introduction and history & developments of microbiology, scope of microbiology, general characteristics of prokaryotes and eukaryotes, classification of prokaryotes, introduction to mycology, virology and parasitology **STRUCTURE OF BACTERIAL CELL** structure and functions of gram positive and gram negative bacteria, cell wall, cell membrane, cytoplasmic inclusions and mesosomes, flagella, capsule, ribosome, chromosome, plasmid and endospore, morphological classification of bacteria	8
II	**MICROSCOPY** Definition,Importance of microscopy, principle, operation and applications of light microscope, phase contrast microscopy, fluorescence microscopy, electron microscopy **STERILIZATION AND DISINFECTION** Introduction and its types, principle,procedure and its application, definition and types of disinfectant, quality control for sterilization and disinfection, biosafety in microbiology lab, biowaste management	12
III	**CHEMOTHERAPY AND CHEMOTHERAPEUTIC AGENTS** Introduction, types of chemotherapeutic agents, mode of action and clinical importance of different chemotherapeutic agents, antibiotic sensitivity tests and its medical importance, introduction,types,mode of action and importance of multiple drugs resistance, mechanism of drug resistance **NORMAL MICROBIAL FLORA AND PATHOGENIC MICROORGANISMS** Normal microbial flora of the human body, collection and transport of specimens, processing of clinical specimens for microbiological examination **MICROBIAL NUTRITION AND GROWTH** Growth kinetics, different types of culture medium, continuous culture and synchronous growth cultures, aerobic & anaerobic cultures, Introduction and its types, various affecting factors on microbial growth	15
IV	**NOSOCOMIAL INFECTIONS** Introduction and its types, pathogenicity and laboratory diagnosis of nosocomial infection, prevention and control of nosocomial infections **ENVIRONMENTAL MICROBIOLOGY** Bacteriology of air, water, food, milk, soil	12

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	TORTORA, G.J., FUNKE, B.R., AND CASE, C.L	MICROBIOLOGY: AN INTRODUCTION	BENJAMIN/CUMMINGS PUBLISHING COMPANY, INC.
2	PELCZAR, M.T.	MICROBIOLOGY	TATA MCGRAW HILL PUBLICATION, NEW DELHI.
3.	SCHEGEL, H.G	GENERAL MICROBIOLOGY	CAMBRIDGE UNIVERSITY PRESS
4.	STANIER, R.Y.	GENERAL MICROBIOLOGY	MACMILLIAN PRESS LONDON.

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 104-21**			
Subject Title	**Immunology**			
Contact Hours	**L:4**	**T:0**	**P:0**	**Credits:4**
Examination Duration (Hrs)	**3**			
Objective	**To teach basic concepts of Immunology**			

Details of the Course

UNIT	CONTENTS	HOURS
I	**INTRODUCTION TO IMMUNE SYSTEM** Introduction and overview of different types of immunity: innate and adaptive immunity, primary and secondary lymphoid tissues and organs, cells of immune system **ANTIGENS** Factors responsible for immunogenicity, immunogen, hapten and adjuvants, epitopes, heterophile antigen, super antigen. **ANTIBODIES** Structure and function of immunoglobulins, monoclonal antibodies, immunoglobulin genes, generation of antibody diversity, immunoglobulin superfamily **ANTIGEN & ANTIBODY REACTIONS** Molecular mechanism of antigen - antibody binding, precipitation and agglutination reaction, immunoelectrophoresis and immunofluorescence, ELISA and Western blotting.	15
II	**MHC** Structure of MHC molecules, MHC and peptide interaction, antigen processing and presentation, transplantation rejection, HLA complex in human **B CELL &T CELL ACTIVATION** BCR and TCR, cell interactions in antibody response, B cell activation, synthesis and secretion of immunoglobulin's, T cell maturation, activation and differentiation	12
III	**CYTOKINES** Common properties of cytokines and cytokine types, biological activities of cytokines, pro-inflammatory cytokines, cytokine diseases and therapies **HUMORAL & CELL-MEDIATED EFFECTOR RESPONSES** Immune responses to infection, leukocyte recirculation and inflammation, neutralization, opsonisation and ADCC, vaccines	12
IV	**AUTOIMMUNITY AND TOLERANCE** Mechanism of self tolerance, immune deficiency diseases, hypersensitivity reactions, AIDS, cancer and the immune system **COMPLEMENT SYSTEM** Introduction to complement system, classical, alternative and lectin complement pathway, biological effect of complement system, regulation of complement system	12

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	KINDT, T.L., GOLDSBY, R.A. AND OSBORNE, B.A	KUBY IMMUNOLOGY	W.H FREEMAN AND COMPANY (NEW YORK)
2	COICO, R AND SUNSHINE, G	IMMUNOLOGY: A SHORT COURSE	JOHN WILEY& SONS, INC (NEW JERSEY)
3.	MURPHY, K., MOWAT, A., AND WEAVER, C.T	JANEWAY'S IMMUNOBIOLOGY	GARLAND SCIENCE (LONDON & NEW YORK)

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 105-21**			
Subject Title	**Human Anatomy & Physiology Lab**			
Contact Hours	**L:0**	**T:0**	**P:6**	**Credits:3**
Examination Duration (Hrs)	**3**			
Objective	**To learn the basic skills and practical knowledge of Human Anatomy & Physiology**			

Details of the Course

CONTENTS
1. Demonstration of parts of circulatory system from models. 2. Demonstration of parts of respiratory system from models. 3. Demonstration of digestive system from models. 4. Demonstration of nervous system from models. 5. Demonstration of Excretory System from Models. 6. Structure of human heart. 7. Demonstration of various parts of male & female reproductive system from models

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 106-21**			
Subject Title	**Clinical Microbiology Lab**			
Contact Hours	**L:0**	**T:0**	**P:6**	**Credits:3**
Examination Duration (Hrs)	**3**			
Objective	**To learn the basic skills and practical knowledge of Clinical Microbiology**			

Details of the Course

CONTENTS
Simple staining of bacteria • To prepare bacterial smear and perform simple staining using methylene blue **Gram staining** • To perform Gram staining of different bacterial cultures **Special stain** • To perform endospore staining, acid-fast staining and Albert's staining of bacterial cultures **Counting of bacterial cell** • To perform viable count of bacteria using pour plating technique **Effect of nutritional factors on growth** • To study the effect of different carbon & nitrogen sources on the growth of microorganisms **Effect of environmental factors on growth** • To study the effect of pH on the growth of microorganisms • To study the effects of UV radiation on growth of microorganisms **Bacteriological examination of water & milk** • To perform the bacteriological examination of water and milk • To perform the bacteriological examination of milk by methylene reductase test **Microbes in hospital environment** • To isolate and identify the bacteria and fungi from hospital environment

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**M.Sc. Medical Microbiology**			
Subject Code	**MMB 107-21**			
Subject Title	**Clinical Biochemistry Lab**			
Contact Hours	**L:0**	**T:0**	**P:6**	**Credits:3**
Examination Duration (Hrs)	**3**			
Objective	**To learn the basic skills and practical knowledge of Clinical Biochemistry**			

Details of the Course

CONTENTS

Qualitative analysis of biomolecules

• Qualitative test for carbohydrates: Molisch Test, Benedict test
• Qualitative test for amino acid and protein: Biuret test, Ninhydrin test
• Qualitative test for lipid: Acrolein test

Quantitative analysis of blood parameters 1

• Quantitative estimation of blood cholesterol
• Quantitative estimation of blood glucose
• Quantitative estimation of blood urea

Quantitative analysis of blood parameters 2

• Quantitative estimation of creatinine
• Quantitative estimation of protein albumin
• Quantitative estimation of uric acid

Quantitative analysis of liver enzymatic markers

• Quantitative estimation of SGPT
• Quantitative estimation of ALP

Quantitative analysis of heart enzymatic marker

• Quantitative estimation of SGOT a cardiac marker

Quantitative analysis of prostate gland enzymatic marker

• Quantitative estimation of ACP