Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02CBMC51	Title of the Course	Medical Microbiology
Total Credits of the Course	04	Hours per Week	4hr

Course Objectives:	The objective of the paper is to 1. Provide knowledge about the composition, structure, and function of organelles and other cellular components 2. Get familiar with various microscopy techniques. 3. Learn in detail about the central dogma. 4. Understand general principles of gene organization and expression in prokaryotic and eukaryotic organisms as well as various levels of gene regulation

Course Content		
Unit	Description	Weightage * (%)
1.	Basics in Medical Microbiology: Sources of infection, Modes of transmission, Factors predisposing to microbial pathogenicity, Types of infectious diseases, Prevention and Control of Hospital-acquired infections. Immunoprophylaxis: Types of vaccines and schedule of vaccination. Recent advances in diagnostic microbiology: Automation, Nucleic acid-based detection methods.	25
2.	Bacteriology: Morphology, Cultural Characteristics, Antigenic structures, Pathogenesis, Laboratory Diagnosis of following bacteria: *Staphylococcus, Streptococcus including Pneumococcus, Bacillus, Corynebacterium, Clostridium, Mycobacteria, Vibrios, E. coli, Salmonella, Shighella, Spirochaetes, Neisseria,*	25
3.	Virology: The Nature and classification of viruses, Morphology: virus structureand Virus replication. General properties, diseases caused lab diagnosis and preventionof Pox, Herpes (HSV), Hepatitis (HAV & HAB), Picorna (Polio virus), Orthomyxo (Influenza), Paramyxo (Mumps and Measles),Rabdo (Rabies), Ebola, Zika and HIV. Viral vaccines and	25

	antiviralagents.	
4.	Parasitology & Mycology**:** Parasitology: Laboratory techniques in parasitology. Morphology, life cycle, laboratory diagnosis of following parasites *Parasites: Entamoeba, Giardia, Leishmania, Plasmodium, Helminths: Taenia, Ascaris, Wuchereriabancrofti, Schistosomes,* Mycology: Morphology, diseases caused and lab diagnosis of: Opportunistic fungi - *Cryptococcus, Candida, Aspergillus.* Fungi causing Cutaneous mycoses- *Dermatophytes,* Subcutaneous mycoses -*Mycetoma*,Systemic mycoses- *Histoplasma*	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a) Conventional black board and chalk. b) ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources..

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Tell about the various classes of microbial infections, their mode of transmission, diagnoses, and treatment
2.	Understand the epidemiology, symptoms, and lifecycle of parasites and helminthes
3.	Know about the viral diseases and pathogenicity of viruses
4.	Know morphology of fungi and different types of Mycoses

Suggested References:	
Sr. No.	References
1.	Textbook of Microbiology: Surinder Kumar
2.	Medical Parasitology: R. Karyakarte.
3.	Text Books of Medical Laboratory Technology: P. B. Godkar
4.	A Text-Book of Medical Microbiology: Anathanarayana&Panikar

On-line resources to be used if available as reference material
On-line Resources: https://www.digimat.in/nptel/courses/medical/microbiology/MB11.html https://nptel.ac.in/courses/102/103/102103015/ http://textbookofbacteriology.net/

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02CBMC52	Title of the Course	Biomaterial and Tissue Engineering
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	The objective of the paper is to 1. Provide understanding about various types of biomaterial used in biomedical science and how the choice of biomaterials is made. 2. Learn about basic function and performance implant materials. 3. Learn about corrosion and degradation mechanisms of biomaterials 4. Understand bio-adhesion and scaffolds for tissueengineering

Course Content		
Unit	Description	Weightage* (%)
1.	Biomaterials: Introduction-definition of biomaterials, applications of biomaterials, classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials. Biological responses (extra and intra-vascular system). Surface properties of materials, physical properties of materials, mechanicalproperties.	25
2.	Types of implant materials: i. Metallic implant materials: Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking, corrosion behavior, and the importance of passive films for tissueadhesion. ii. Polymeric implant materials: types, general classification; some commonly used polymers: Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers, silicone rubbers, acetals. (Classification according to thermosets, thermoplastics, and elastomers). Importance of molecular structure, hydrophilic and hydrophobic surface properties, Physiochemical iii. Characteristics of biopolymers. Biodegradable polymers for medical purposes, Biopolymers in controlled release systems. Synthetic polymeric membranes and their biologicalapplications.	25

	iv. Ceramic implant materials: Definition of bioceramics. Common types of bioceramics: Aluminium oxides, Glass-ceramics, Carbons. Bioresorbable and bioactive ceramics. Importance of wear resistance and low fracture toughness. Host tissue reactions: the importance of interfacial tissue reaction (e.g. ceramic/bone tissuereaction). v. Composite implant materials: different reinforcement materials, Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Mechanics of improvement of properties by incorporating differentelements.	
3.	Tissue engineering Introduction, Stem cells, Morphogenesis, Generation of tissue in the embryo, Tissue homeostasis, Cellular signaling, Extracellular matrix as a biologic scaffold for tissue engineering, Scaffold fabrication, bioactive scaffold, Natural polymers in tissue engineering applications, Degradable polymers for tissueengineering.	25
4.	Basic Biology Of Stem Cells: Stem Cells: Introduction, hematopoietic differentiation pathway Potency, and plasticity of stem cells,sources, embryonic stem cells,hematopoietic and mesenchymal stem cells,Stem Cell markers, FACS analysis, Differentiation, Stem cell systems- Liver, neuronal stem cells, Types & sources of stem cell with characteristics: embryonic, adult, haematopoetic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells induced pluripotent stemcells.	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Viva-voce, Quizzes,	15%

	Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	To understand various types of biomaterials, having biomedical applications.
2.	Basic function and performance implant materials.
3.	Corrosion and degradation mechanisms of biomaterials
4.	Choice of biomaterials based on function, biological environments, toxicity.
5.	Bioadhesion and implant surface interaction with tissues.
6.	Scaffolds for tissue-engineering, growth factor, stem cell signaling.

Suggested References:	
Sr. No.	References
1.	Tissue Engineering: Bernhard O Palsson, Sangeeta N.Bhatia.
2.	Fundamentals of Tissue Engineering and Regenerative Medicine: Meyer, U: Meyer, Th.; Handschel, J.; Wiesmann,H.P.
3.	Science and Engineering: J B Park,Biomaterials.
4.	Biomaterials: SujataV.Bhat

On-line resources to be used if available as reference material

Online Resources:
https://nptel.ac.in/courses/102/106/102106081/
https://nptel.ac.in/courses/102/106/102106036/
https://ocw.mit.edu/courses/materials-science-and-engineering/3-051j-materials-for-biomedical-applications-spring-2006/lecture-notes/

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Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02CBMC53	Title of the Course	Immunology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to 1. Provide understanding about the cells and organs of the immune system 2. Educate about the structure of an antibody, classes of antibody, mechanism of antibody diversity generation. 3. Teach various techniques used in Immunology for diagnosis and research 4. Provide understanding about the development of allergy, autoimmune disease, etc.

Course Content		
Unit	Description	Weightage * (%)
1.	Innate and adaptive immunity: role of cells, receptors, and proteins in innate immunity, the ubiquityof the innate system.Cells and organs of the immune system: Hematopoiesis, primary and secondary lymphoidorgans. Complement: components of the system, activation, regulation, biological consequences, and deficiency diseases. Inflammation and anti-inflammatoryagents.	25
2.	Antigens and antibodies: properties of immunogens, haptens, epitopes, structure, and classes ofimmunoglobulins, biological activities and effector functions, monoclonal antibodies, and abzymes. Antibody diversity: models, organization of Ig genes, mechanism of gene rearrangement, generation of diversity; expression, synthesis and class switching, antibody engineering. Production of polyclonal and monoclonal antibodies: Principles, Techniques, and applications. Antigen-antibody interactions: Agglutination and precipitation techniques, Radio Immunoassay,ELISA, Immunofluorescence	25

	assays: Florescence activated cell sorter (FACS) technique, Cytotoxicity assay, Cytokines assays: ELISA and ELISPOT	
3.	Major Histocompatibility Complex and Antigen Presentation: MHC- organization, inheritance, genes,moleculesand peptide binding, expression,diseasesusceptibility,immune responsiveness,self MHC restriction, the cytosolic and endocytic pathway for antigenprocessing. T-cell receptor, T-cell maturation, activation, and differentiation: TCR-genetic organization andrearrangement of genes, TCR-complex, peptide binding, thymic selection, activation and differentiation of T cells. Generation, activation, and differentiation of B cells: B cell maturation, activation, and proliferation, germinal centers, regulation of the responses. Cell-mediated cytotoxicity: Effector T cells, cytotoxic T cells, NK cells, ADCC.	25
4.	Hypersensitivity reactions: classification and types of hypersensitivity reactions. Immune tolerance and autoimmunity: establishment and failure of tolerance, autoimmune diseases, mechanisms for the induction, animal models,treatment. Transplantation immunology: basis and the manifestation of graft rejection, immunosuppressive therapy, immune tolerance.Experimental systems inimmunology	25
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Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written Examination (As per CBCS R.6.8.3)	15%

2.	Internal Continuous Assessment in the form of Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Able to learn about the cells and organs of the immune system
2.	Learn about the structure of an antibody, classes of antibodies, mechanism of antibody diversity generation.
3.	Knowledge about various techniques used in Immunology for diagnosis and research
4.	Reasons for the development of allergy, autoimmune disease, etc.

Suggested References:	
Sr. No.	References
1.	Kuby immunology: Owen, J. A., Punt, J., &Stanford,S.
2.	Janeway'sImmunobiology: Murphy, K., & Weaver,C.
3.	Immunology:Male,D.,Brostoff,J.,Roth,D.,&Roitt,
4.	Cellularandmolecularimmunology:Abbas,A.K.,Lichtman,A.H.,&Pillai,S.

On-line resources to be used if available as reference material
Online Resources: https://nptel.ac.in/courses/102/105/102105083/ http://www.helmberg.at/immunology.pdf http://www.umich.edu/~bmsteach/lopatin/Immunology/Immunology.html https://icuadelaide.com.au/files/primary/physiology/immunology.pdf

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Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02CBMC54	Title of the Course	Practical based on PT02CBMC51 and PT02CBMC52
Total Credits of the Course	06	Hours per Week	4hr

Course Objectives:	The objective of the paper is to 1. Provide knowledge about Practical based on PT02CBMC51 and PT02CBMC52 2. Get familiar with basic instrumental techniques.

Course Content		
Unit	Description	Weightage* (%)
	1. Serial Dilution and Pour Plate method for isolation and enumeration ofMicroorganisms 2. Isolation of bacteria by Streak Plate Method and Spread Plate Method 3. Simple Staining (Monochrome Staining) 4. Negative Staining 5. Metachromatic Granule Staining 6. Spirochete Staining 7. Gram's staining 8. Endospore Staining 9. Cell Wall Staining 10. Capsule Staining 11. Preparation of media and Sera 12. Primary cell culture 13. Preparation of established cell line 14. MTT assay (Animal cell culture) 15. Isolation of lactic acid bacteria 16. Antimicrobial activity of Lactobacillus strains 17. Microbiological analysis of drinking water (Detection and enumeration of coliforms, Fecal coliform MPN test, Detection of E. coli, Differentiation of coliforms)	100

	18. Detection and enumeration of fecal Streptococcus and Enterococcus groups from recreational water 19. Screening and isolation of proteolytic bacteria 20. Determination of Viscosity of biomaterial by rheological studies	

Teaching-Learning Methodology	• We make extensive use of a chalkboard. • ICT tools such as projectors, smart boards, etc are also used for a better explanation of scientific components. • Detail lecture notes and other reference materials are also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Practical Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Basic Dilution methods, Isolation of Microorganisms, Learn Basic staining techniques, etc.
2.	Understand primary cell line and secondary cell line, preparation of media, etc.
3.	Know about the different mechanical and thermal characteristics of Biomaterial.
4.	Know different methods used for measurement of viscosity of biomaterial

Suggested References:	
Sr. No.	References
1.	Experimental Microbiology by Rakesh Patel &Kiran Patel

On-line resources to be used if available as reference material

On-line Resources:
https://mvi-au.vlabs.ac.in/

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02CBMC55	Title of the Course	Practical based on PT02CBMC53and PT02CBMC51
Total Credits of the Course	06	Hours per Week	4hr

Course Objectives:	The objective of the paper is to 1. Provide knowledge about Practical based on PT02CBMC53 and PT02CBMC51 2. Get familiar with basic instrumental techniques.

Course Content		
Unit	Description	Weightage* (%)
1.	1. ABO and Rh typing of blood cells 2. Rocket Immunoelectrophoresis. 3. To perform RPR test 4. To perform sandwich Dot ELISA test for antigen. 5. To learn the technique of Redial Immuno-diffusion. 6. To perform double immune diffusion by using the ouchterlony method 7. WIDAL test 8. Hb estimation 9. Blood glucose estimation 10. Demonstration of Microplate reader 11. Genomic DNA isolation from Blood 12. DNA elution 13. Transformation of plasmid DNA by using $CaCl_2$. 14. Introduction to a genome sequence database 15. Protein and DNA sequence database 16. Visit the hospital. 17. Estimation of Urea by DAM method. 18. Estimation of Triglyceride by GPO method. 19. Quantitative estimation of total carbohydrates 20. Quantitative estimation of reducing and nonreducing sugars	100

	21. Qualitative analysis of aminoacids 22. Quantitative estimation of amino acids	

Teaching-Learning Methodology	• We make extensive use of a chalkboard. • ICT tools such as projectors, smart boards, etc are also used for a better explanation of scientific components. • Detail lecture notes and other reference materials are also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Practical Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Basic methods for the immunology practical's
2.	Estimation of .different micro compounds in Blood
3.	Know about the different sophisticated instruments working.
4.	Know different methods used DNA isolation from different materials

Suggested References:	
Sr. No.	References
1.	Practical's in Immunology by Frank C. Hay and Olwyn M. R. Westwood
2.	Clinical Laboratory Science and Molecular Diagnosis: Praful B. Godkar&Darshan P. Godkar
3.	Molecular Cloning: A Laboratory Manual: Joe Sambrook
4.	Biochemical methods: S. Sadasivam& A. Manickam

On-line resources to be used if available as reference material
On-line Resources: https://vlab.amrita.edu/?sub=3&brch=69 https://books.google.co.in/books?printsec=frontcover&vid=LCCN00064380&redir_esc=y#v=onepage&q&f=false

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02CBMC56	Title of the Course	Comprehensive Viva
Total Credits of the Course	04	Hours per Week	4hr

Course Objectives:	The objective of the viva is to 1. To check the in-depth knowledge gain by the students throughout the semester

Course Content		
Unit	Description	Weightage* (%)
1.	Evaluation of knowledge gained from three core, one elective and two practical by conducting comprehensive viva	50

Teaching-Learning Methodology	Internal Continuous Assessment in the form of Viva-voce

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Will be able to defend the questions related to core and elective papers studied during semester-II

Suggested References:	
Sr. No.	References

	NIL

On-line resources to be used if available as reference material
Online Resources: ---

Master Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02EBMC51	Title of the Course	Molecular Medicine
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to 1. Learn about the genome anatomy and genome variation using the bioinformatics tools 2. Acquire knowledge about personalized medicine, DNA genetics, and regenerative medicine. 3. Provide an understandingof the molecular mechanism of disease development and to tech molecular or cellular biology importance in characterizing cellular processes. 4. Educate about the cause, development, and diagnosis of cancer and Its prevention using advanced means.

Course Content		
Unit	Description	Weightage* (%)
1.	Genome Biology: Genome anatomy, Human Genome project, Bioinformatic analysis of human genome, genome variation, personalized medicine, DNA Genetic Testing, OMIC technologies	25
2.	Molecular and Cellular Physiology: History of Molecular Medicine, Recombinant DNA Products in health and diseases, Gene Transfer, Regenerative Medicine, fundamentals of cytometry, Cell based therapy	25
3.	Biochemical and molecular basis of pathogenesis, clinical course, diagnosis and treatment of diseases**:** Liver diseases like jaundice, hepatitis, fibrosis, necrosis, and cirrhosis; Haemoglobinopathies, Otheranemias, plasma protein abnormalities; Multifactorial diseases. Like Diabetes, Atherosclerosis, and Arthritis; Thyroid disorders, infertility and neurodegenerative disorders including Alzheimer's and Parkinson'sdisease.	25

4.	Cancer Biology: Development, Aging, and Cancer, Genomic instability in Cancer, Molecular diagnosis of cancer, molecular medicine in targeted therapy of cancer, Drug resistance in cancer,Pharmacogenomics	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about the genome anatomy and genome variation using the bioinformatics tools
2.	Acquire knowledge about personalized medicine, DNA Genetic, and regenerative medicine
3.	Understand the molecular mechanism of disease development and know molecular or cellular biology can be used to characterize cellular processes.
4.	They will be able to describe the cause, development, and diagnosis of cancer and its prevention using advanced means.

Suggested References:	
Sr. No.	References

1.	Molecular Medicine Genomics to Personalized Healthcare: Ronald JTrent
2.	Teitz'sFundamentalsofClinicalChemistry:Burtis,C.A.&Ashwood,E.R
3.	Biochemical Basis of Diseases: Cohn R. M. and Roth K.S.
4.	Biochemistry in Clinical Practice: Williams D. L. and MarksV.

On-line resources to be used if available as reference material
Online Resources: https://ocw.mit.edu/courses/health-sciences-and-technology/hst-161-molecular-biology-and-genetics-in-modern-medicine-fall-2007/lecture-notes/ https://nptel.ac.in/content/storage2/courses/104103068/pdf/M4.pdf https://www.enpab.it/images/2018/E-book-Biologia%20Clinica%2001_Clinical%20Biochemistry%20and%20Metabolic%20Medicine%20-%20Martin%20Andrew%20Crook.pdf https://nptel.ac.in/content/storage2/courses/102101007/downloads/TRANSCRIPT/LEC-03-TRANSCRIPT.pdf

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Master's Degree in Biomedical Science
M.Sc. (Biomedical Science) Semester II

Course Code	PT02EBMC52	Title of the Course	Clinical and Applied Physiology
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to 1. Provide understanding about the physiology of nervous, muscular system, circulatory system, urinary and reproductive systems, and physiology of endocrine glands 2. Teach the used in various clinical testing to solve diagnostic and therapeutic problems.

Course Content		
Unit	Description	Weightage * (%)
1.	Physiology of nervous and muscular system: Basic principles of Neurophysiology: components of Nervous system- CNS, PNS, ANS; diseases of the nervous system; Physiology of Muscular System: basic anatomy of the muscular system, functions of the muscular system and diseases of the muscularsystem	25
2.	Physiology of circulation: Structure and functions of heart, Physiology of cardiac muscle, Cardiac cycle, Rhythmical excitation of heart, Regulation of heart pumping, Control of excitation and conduction in the heart. Physical characteristics and basic theory of circulation, Capillary fluid exchange, interstitial fluid, and lymph flow. Circulatory regulation: Local control of blood flow by tissues and humoral regulation, Nervous regulation of circulation; blood components and functions; diseases of heart andcirculation	25
3.	Physiology of Urinary and Reproductive Systems: Structure and functions of kidneys, structure, and function of reproductive systems, diseases of renal systems; diseases of reproductivesystems	25

4.	Physiology of Endocrine glands: An overview of the human endocrine the system, hormones of the endocrine system, diseases of endocrine gland	25

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the physiology of the nervous, muscular system, circulatory system, urinary And reproductive systems and physiology of endocrine glands
2.	Acquire knowledge of human physiology and effectively used it in a various clinical Testing to solve diagnostic and therapeutic problems.

Suggested References:	
Sr. No.	References
1.	Hall J. E., Guyton & Hall Text Book of MedicalPhysiology,
2.	Barrett K E., Barman S. M., Boitano S., Brooks H. L., Ganong's Review of Medical Physiology, McGraw-Hill Medical
3.	Tortora G. J., Derrickson B. H., Principles of Anatomy and Physiology

Masters in Biomedical Science
M.Sc (Biomedical Science) Semester II

Course Code	PT02EBMC53	Title of the Course	Bio-Safety and Biomedical Waste Management
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	The objective of the paper is to • Teach how to manage biomedical waste • Provide Knowledge about various biomedical management and handling rules • Learn the treatment and disposable techniques used for biomedical management • Teach biomedical waste management rules.

Course Content		
Unit	Description	Weightage* (%)
1.	Waste disposal management, Hospital waste management, Biosafety- regulatory framework for GMOs, bioethics and its socio economic impact, Hazards associated with poor health care waste management	25
2.	Characterization of medical waste- Bio-medical wastes (Management and Handling) Rules, 1998, Amendments and guidelines, segregation, packaging, storage, transport of infectious waste. Techniques of Biomedical waste management. Health and safety rules. Protocols, issues, and challenges in transportation of Biomedical waste.	25
3.	Treatment method- Autoclave, Hydroclave, Microwave, Chemical Disinfection, Solidification and stabilization, Bioremediation, Thermal Conversion Technologies, accumulation and storage of hazardous waste, land disposal of hazardous waste, other treatment and disposal method. Common Hazardous Waste Treatment Facilities (TSDF).	25
4.	Biomedical waste management rule: Biomedical wastes categories and their segregation, collection, treatment, processing, and disposal options, Standards For Treatment and Disposal Of Bio-Medical wastes,	25

	Standards for autoclaving of bio-medical waste, standards of microwaving, standards for deep burial, standards for the efficacy of chemical disinfection, standards for dry heat sterilization, standards for liquid waste	

Teaching-Learning Methodology	• Regular class room teaching will be done with following tools: a. Conventional black board and chalk. b. ICT tools such as projectors, smart boards, etc will also be used for better explanation of scientific components. • Appropriate reference materials will also provided to the students as and when required from departmental library resources.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand how to manage biomedical waste
2.	Know various biomedical management and handling rules
3.	Learn the treatment and disposable techniques of biomedical management
4.	Know various biomedical waste management rules.

Suggested References:	
Sr. No.	References

1.	Biomedical Waste Management: R. Radharisham
2.	Hospital Waste Management's-A guide for self-assessment and review: ShishirBasarkar
3.	Biomedical Waste Disposal: Anantpreet Singh and Sukhjit Kaur
4.	Medical Waste Management and Disposal: V. J. Landrum

On-line resources to be used if available as reference material
Online Resources: https://dth.ac.in/medical/courses/Microbiology/block-9/3/index.php https://www.aiims.edu/en/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html

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