GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Biomedical Engineering
Semester	VIII	Version	2.0.0.0
Effective from Academic Year	2017-18	Effective for the batch Admitted in	July 2017
Subject code	2BM803	Subject Name	Transportation Phenomena in Living Systems

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	-	-	-	4	Theory	40	60	100
Hours	4	-	-	-	4	Practical	-	-	-

Pre-requisites: Good Knowledge of Human Biology, Heat Transfer and Mass Transfer Mechanics.

Learning Outcome: The educational objectives of the course are to educate students to attain the following:

- Understanding of how heat transferred internally from one region to another region of body by different models.
- Understanding of how blood transfer materials to and from the billions of capillaries in the body
- Understanding of mass transfer mechanism in different medical instruments.

Theory syllabus

Unit	Content	Hrs.
1	The Human Thermal System, Thermo-Regulatory system, Production and Heat Loss, Modes of Heat Transfer, Heat Transfer within a Body, Heat transportation in Tissues, Muscles, Skin and other Organs in different environmental temperatures, Structure of Blood Perfused Tissue, Pennes Bioheat Model, Wulff Continuum Model, Chen-Holmes Continuum Model, Weinbaum, Jiji and Lemons Bioheat Model	**12**
2	Fundamentals and applications of mass transport, Biomedical Mass Transport, Membrane, Pores and Diffusion, Mass Transport in Systemic Capillaries, Mass Transport in Kidney and Dialysis	**10**
3	Transport through Cell Membrane: Structure, Chemical Composition and Permeability, Solvent Movement across Membrane, Osmolality and Tonicities, Quantitative representation of Osmotic Flux, Active Transport, Reverse Osmosis through natural Membrane system, Reverse Osmosis through artificial synthetics Membranes.	**12**
4	Mass Balance on the Lungs, Gas Transport Mechanism in Lungs, Oxygen and Carbon Dioxide Transport in the Blood, O2 and CO2 Transfer from Tissues, Mass Transfer Resistances in Respiratory Systems	**10**
5	Artificial Heart - Lung Devices: Ideal Heart – Lung Device, Oxygenator, Temperature Maintenance, Gas Flow Requirement for Artificial Lungs, Area Requirement for Membrane Oxygenators. Mass transfer in Skeletal, Nervous, G.I. System, Cardio Pulmonary System	**12**

Text Books:

1	Biomedical Engineering Principles: An Introduction to Fluid, Heat & Mass transport process By: David. O. Cooney, Pub.: Marcel Dekker

Reference Books

1	Basic Transport Phenomena in Biomedical Engineering By: Fournier, Ronald L. Pub.:Tayior & Francis. 1998
2	Introduction to Biomedical Engineering by John Enderle & Joseph Bronzino Pub. Academic Press