GANPAT UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology				Branch/Spec.	Biomedical Engineering			
Semester	V				Version	2.0.0.0			
Effective from Academic Year		2024-25			Effective for the batch Admitted in			July 2022	
Course code	2BM5101		Course Name		Physiological Control Systems & Modeling				

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	1	-	4	Theory	40	60	100
Hours	3	-	2	-	5	Practical	30	20	50

Pre-requisites
Basic knowledge of human physiology and control system.

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

CO1	**Demonstrate** a thorough understanding of major physiological systems.
CO2	**Develop** skills in constructing mathematical models to represent physiological processes and their regulatory mechanisms.
CO3	**Analyze** the stability and response characteristics of physiological control systems by changing parameter values.
CO4	**Utilize** simulation tools to model and analyze the behaviour of physiological systems under various conditions.

Theory syllabus

Unit	Content	Hrs.
1	INTRODUCTION Basics of physiological control system, Physiological control system analysis, Characteristics of engineering and physiological control system, Feedback and feed forward physiological control system, Applications of control theory to physiological systems.	7
2	MODELING-GRAPHICAL & MATHEMATICAL Generalized system properties, Models with combinations of system elements, linear model of physiological system, Distributed parameters verses lumped parameter models, Principal of super position.	7
3	STATIC ANALYSIS OF PHYSIOLOGICAL SYSTEM Close loop verses open loop system, Steady state analysis of muscle stretch reflex, Regulation of cardiac output& venous return, Regulation of glucose - insulation, Chemical regulation of ventilation, Implementation & analysis of models using Simulink.	9
4	TIME DOMAIN ANALYSIS Transient response first and second order, Transient response analysis of linearized lung mechanics, Transient response analysis of neuromuscular reflex motion model by Simulink.	6
5	FREQUENCY DOMAIN ANALYSIS Correlation between time and frequency analysis, Frequency response analysis of linearized lung mechanics, circulatory control system, frequency response of glucose insulin regulation using MATLAB tool.	7
6	STABILITY ANALYSIS Pupillary light reflex and cheyne-stokes breathing stability analysis.	4
7	Modeling of thermoregulatory system, Eye movement system and wertheimer's saccade eye model, Oculomotor muscle model.	5

Practical Contents

	Term work and practical shall be based on the above syllabus.
Text Books	
1	Physiological Control Systems: Analysis, Simulation and Estimation by Michael C. K. Khoo, Pub.: John Wiley and Sons
Reference Books	
1	Biological Control System Analysis by Milsum John H. Pub.: McGraw Hill
2	Virtual Bioinstrumentation: Biomedical, Clinical and Healthcare Applications in LabVIEW by Jon B. Olansen and Eric Rosow Pub.: Prentice Hall
ICT references	
1	http://nptel.ac.in/courses/108103007/
2	http://nptel.ac.in/courses/108101037/
3	https://www.youtube.com/watch?v=F0OBkR00OZE
4	https://www.youtube.com/watch?v=OlHez8gwMgw

Mapping of CO with PO and PSO:															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	2	0	1	0	0	1	2	0	2	2	1	0
CO2	3	2	2	2	3	1	0	2	1	3	1	1	3	2	3
CO3	2	2	1	3	2	0	0	1	1	1	2	1	3	1	2
CO4	2	2	2	2	3	1	1	1	1	2	2	1	3	2	2