



LESSON PLAN

Course Code	Course Title	Semester	Branch	Contact Periods /Week	Academic Year	Date of commencement of the semester
23RB7E00	BIO-INSPIRED ROBOTICS	VII	ROBO	4	2026-27	17-06-2026
COURSE OUTCOMES: Students are able to						
1	Explain the fundamentals of bio-inspired robotics, biomimicry, and their significance in engineering applications. [K2]					
2	Analyze various biological locomotion mechanisms (terrestrial, aerial, aquatic) and apply them to robotic system design. [K4]					
3	Illustrate the working principles of bio-inspired sensors, actuators, and smart materials used in robotics. [K2]					
4	Apply biological control strategies such as neural networks, Central Pattern Generators (CPG), and swarm intelligence in robotic systems. [K3]					
5	Develop bio-inspired robotic systems by integrating mechanical structure, sensing, actuation, and control techniques. [K3]					
6	Evaluate the performance, applications, ethical issues, and future trends of bio-inspired robots in real-world scenarios. [K4]					
UNIT	Outcomes/ Bloom's Level	Topic s No.	Topics/Activity	Text Book /Reference	Contact Hour	Delivery Method
I	CO1.Explain the fundamentals of bio-inspired robotics, biomimicry, and their significance in engineering applications. [K2]	UNIT I Introduction to Bio-Inspired Robotics				Chalk, Talk, Active Learning, PPT
		1.1	Overview of bio-inspired engineering and robotics	T1, R1	1	
		1.2	Comparison between conventional robots and bio-inspired robots	T1, R1	1	
		1.3	Biological inspiration	T1, R1	1	
		1.4	plants, animals	T1, R1	1	
		1.5	insects, and microorganisms	T1, R1	1	
		1.6	Principles of biomimicry	T2, R1	1	
		1.7	and bio-mimetics	T1, R1	1	
		1.8	Evolutionary concepts in robotics	T1, R1	1	
		1.9	Case studies: insect robots	T1, R1	1	
		1.10	fish robots, snake robots	T1, R1	1	
Total					10	
II		UNIT II Biological Locomotion Mechanisms				
		2.1	Terrestrial locomotion	T2, R1	1	
		2.2	walking, running	T2, R2	1	
		2.3	crawling (insects, mammals),	T2, R1	1	
		2.4	Aerial locomotion: bird flight	T1, R1	1	



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	CO2: Analyze various biological locomotion mechanisms (terrestrial, aerial, aquatic) and apply them to robotic system design. [K4]	2.5	insect flight (flapping wing mechanisms)	T2, R2	1	Chalk, Talk, PPT, Active Learning
		2.6	Aquatic locomotion: fish swimming	T2, R1	1	
		2.7	jellyfish propulsion	T2, R2	1	
		2.8	Kinematics and dynamics of biological motion	T2, R1	1	
		2.9	Gait generation and stability in legged robots	T2, R2	1	
		2.10	Energy efficiency in biological systems.	T2, R1	1	
Total					10	
III	CO3: Illustrate the working principles of bio-inspired sensors, actuators, and smart materials used in robotics. [K2]	UNIT III Sensors and Actuators Inspired by Biology				Chalk, Talk, PPT, Active Learning,
		3.1	Biological sensing systems	T2, R1	1	
		3.2	vision, touch, hearing, smell,	T2, R3	1	
		3.3	Artificial sensors inspired by biology (camera vision, tactile sensors, sonar)	T2, R4	1	
		3.4	Smart materials: shape memory alloys	T2, R1	1	
		3.5	piezoelectric materials	T2, R2	1	
		3.6	electroactive polymers	T2, R2	1	
		3.7	Muscle-inspired actuators and soft actuators	T1, R3	1	
		3.8	Neural control and reflex actions	T2, R1	1	
		3.9	Integration of sensors	T2, R2	1	
		3.10	Actuators in robotic systems	T2, R1	1	
Total					10	
IV	CO4: Apply biological control strategies such as neural networks, Central Pattern Generators (CPG), and swarm intelligence in robotic systems. [K3]	UNIT IV Control Systems and Intelligence				Chalk, Talk, PPT, Active Learning, Seminar, Quiz
		4.1	Neural networks and biological control systems	T2, R3	1	
		4.2	Central Pattern Generators (CPG) for locomotion control	T2, R2	1	
		4.3	Swarm intelligence: ants	T2, R1	1	
		4.4	bees, flocking behavior	T2, R1	1	
		4.5	Evolutionary algorithms and genetic algorithms	T1, R2	2	
		4.6	Learning in robots	R2, R1	1	
		4.7	Reinforcement learning inspired by animal behavior	T1, R3	1	
		4.8	Autonomous navigation	T2, R1	1	
		4.9	and decision-making	T2, R2	1	
Total					10	



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V	CO5: Develop bio-inspired robotic systems by integrating mechanical structure, sensing, actuation, and control techniques. [K3] CO6: Evaluate the performance, applications, ethical issues, and future trends of bio-inspired robots in real-world scenarios. [K4]	UNIT V Design, Applications, and Future Trends				Chalk, Talk, PPT, Active Learning
		5.1	Design methodology for bio-inspired robots	T2, R1	1	
		5.2	Soft robotics and flexible structures	T2, R2	1	
		5.3	Micro and nano bio-inspired robots	T2, R3	1	
		5.4	Applications: Medical	T2, R1	1	
		5.5	robots (surgical, drug delivery)	T2, R2	1	
		5.6	Search and rescue robots	T2, R1	1	
		5.7	Underwater exploration,	T2, R2	1	
		5.8	Agricultural robots,	T2, R3	1	
		5.9	Ethical considerations and challenges	T2, R1	1	
		5.10	Future trends in bio-inspired robotics.	T2, R2	1	
Total				10		
CUMULATIVE PROPOSED PERIODS				50		
Text Books:						
S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION					
1	Maki K. Habib, Bioinspiration and Robotics: Walking and Climbing Robots, 1 st Edition, Intech Open, 2007.					
2	Toshio Fukuda, Fei Chen, Qing Shi, Bio-Inspired Robotics, 1st Edition, MDPI, 2018					
Reference Books:						
S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION					
1	Yan Meng, Yaochu Jin, Bio-Inspired Self-Organizing Robotic Systems, 1 st Edition, Springer, 2011					
2	Philipp Beckerle et al. Novel Bioinspired Actuator Designs for Robotics, 1 st Edition, Springer, 2021					
3	Guoyuan Li, Houxiang Zhang, Jianwei Zhang, Bio-Inspired Locomotion Control of Limbless Robots, 1 st Edition, Springer, 2023					
4	Adam Spiers, Said Ghani Khan, Guido Herrmann, Biologically Inspired Control of Humanoid Robot Arms: Robust and Adaptive Approaches, 1 st Edition, Springer, 2016					
Web Details						
1	https://biomimetics.mit.edu/					
2	https://nptel.ac.in/courses/106106126					

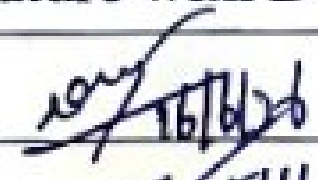
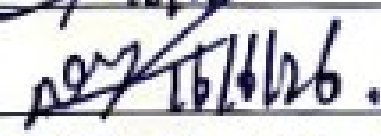
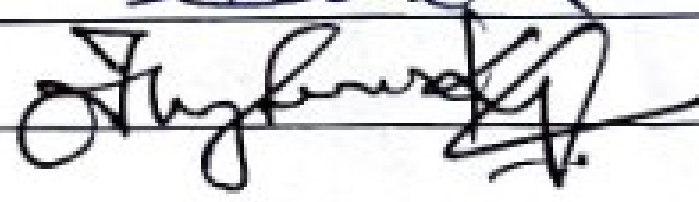


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		Name	Signature with Date
i.	Faculty	Mr.N.Bulli Raju	
ii.	Course Coordinator	Mr.N.Bulli Raju	
iii.	Module Coordinator	Mr.B.Mahesh Krishna	
iv.	Programme Coordinator	Dr. Francis Luther King M	




Principal