

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology				Branch/Spec.		Electronics and Communication Engineering	
Semester		VII				Version		1.0.0.0	
Effective from Academic Year			2026-27			Effective for the Batch admitted in			July 2023
Course Code		2EC71PE02		Course Name			Cyber Physical Systems		
Teaching Scheme					Examination Scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50
Pre-requisites									
Course Outcomes									
On successful completion of the course, the students will be able to:									
CO1	Students should be able to Understand the computer architectural design principles and performance								
CO2	Students should be able to enhancement strategies that adopted in performance evolution of different components of computer, microprocessor / microcontroller and Digital signal processor architecture and distributed memory architecture and distributed systems								
CO3	Students should be able to Solve the performance related problems of real time operating system.								
CO4	Analyze the performance of embedded processing, memory, bus efficiencies, real time operating system performance h/w s/w codesign.								
Theory Syllabus									
Unit	Content								Hrs.
1	Fundamentals of - Cyber Physical Systems Cyber-Physical Systems (CPS) in the real world Basic principles of design and validation of CPS, Industry 4.0 AutoSAR, IIOT implications, Building Automation, Medical CPS								8
2	Platform Components for Cyber Physical Systems CPS HW platforms - Processors, Sensors, Actuators CPS Network - WirelessHart, CAN, Automotive Ethernet Scheduling Real Time CPS tasks: Table-driven and Event driven schedulers Hybrid schedulers								10
3	Principles of Dynamical Systems Dynamical Systems and Stability Controller Design Techniques Performance under Packet drop and Noise								8
4	CPS implementation issues From features to automotive software components Mapping software components to ECUs CPS Performance Analysis: Effect of scheduling, bus latency, sense and actuation faults on control performance, network congestion Building real-time networks for CPS								10
5	Intelligent CPS Safe Reinforcement Learning: Robot motion control, Autonomous Vehicle control Gaussian Process Learning: Smart Grid Demand Response, Building Automation								9
Practical Content									
Practical assignments and tutorials are based on the above syllabus.									
Text Books									
1	Suh, Sang C., U. John Tanik, John N. Carbone, and Abdullah Eroglu, eds. Applied cyber-physical systems. Springer New York, 2014.								
Reference Books									
1	Alur, Rajeev. Principles of cyber-physical systems. MIT Press, 2015								
2	Colombo, Armando W., Thomas Bangemann, Statmatis Karnouskos, Jerker Delsing, Petr Stluka, Robert								

	Harrison, Francois Jammes, and Jose L. Lastra. "Industrial cloud-based cyber-physical systems." <i>The Imc-aesop Approach 22</i> (2014): 4-5.
ICT/MOOCs Reference	
1	Andrew M Sloss, Dominic Symes, Chris Wright, "ARM System Developers Guide: Designing optimizing System Software" (Online resource)
2	https://ptolemy.berkeley.edu/projects/cps/

Mapping of CO with PO and PSO:															
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	P S O 1	P S O 2	P S O 3
CO1	3	1	1	0	0	0	0	1	1	0	0	2	0	1	0
CO2	3	1	1	0	0	0	0	1	1	0	0	2	0	1	0
CO3	3	3	2	2	2	0	0	1	1	0	0	2	1	1	0
CO4	3	3	3	2	2	0	0	2	2	0	0	2	2	2	0