SEMESTER	4
Paper Number	MCMS 4401
Paper Title	IoT and VLSI Design
No. of credits	6
Theory / Composite	Theory
No. of periods assigned	Th: 6
Name of faculty member(s)	
Course description / objectives	On completion of this course, the students will be able to: 1. face challenges in their professional career in industry, government and academia by integrating the existing and advanced knowledge in VLSI circuit design 2. acquire in-depth knowledge of VLSI circuits and construction CMOS circuits 3. design and analyse VLSI/embedded circuits critically, using appropriate analytical methods 4. develop an ability to understand different algorithms related to designing a VLSI circuit 5. comprehend the concept and operation of the Internet of Things (IoT) 6. recognize the factors that led to the rise of IoT 7. comprehend IoT communication protocols 8. learn the use of IoT platforms like Arduino and Raspberry Pi 9. learn about security measures that can stop attacks and threats to the IoT infrastructure
Syllabus	**Module 1: VLSI Design (Theory – 50 marks)** Introduction to VLSI systems: Overview of VLSI technology, Fabrication and Layout of CMOS(Fabrication Process Flow, CMOS n-Well Process, Layout & Design Rules, CMOS inverter Layout Design), IC production process & Packaging, MOS Transistors, Combinational and sequential circuit design, Static and dynamic CMOS gates. VLSI automation Algorithms for Physical Design Partitioning: problem formulation, classification of partitioning algorithms, Group migration algorithms, Kernighan – Lin Heuristics. Floor planning & pin assignment: problem formulation, placement and floor planning, floor planning algorithms for mixed block & cell design, Floor planning based on Simulated Annealing and Simulated Evolution. Global Routing: Global Routing between blocks, classification of global routing algorithms, Maze routing algorithm, line probe algorithm. Detailed routing: Problem formulation, classification of routing algorithms, single layer routing algorithms, constrained & unconstrained via minimization. Testing : Introduction to different types of testing. Introduction to digital design using VHDL. **Module 2: Internet of Things (Theory – 50 marks)** Introduction to Internet of Things: Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, Enabling technologies, IoT challenges, IoT levels, IoT and cyber physical system, IoT and

	WSN, Microcontrollers, and Their Interfacing: Sensor interfacing, Types of sensors, Controlling sensors, Microcontrollers, ARM Protocols for IoT: Messaging protocols, Transport protocols, IPv4, IPv6, URI Cloud for IoT: IoT and cloud, Fog computing, Security in cloud, Case study Application Building with IoT: Various application of IoT Arduino and Raspberry Pi: Architecture, Programming and Application. IoT Security: Various security issues and need, architecture, requirement, challenges and algorithms
Reading/Reference Lists	1. Neil H. E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design,2nd edition, Pearson Education Asia, 2000. 2. John P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley and Sons, Inc., 2002. 3. Samir Palnitkar, Verilog HDL, 2nd Edition,Pearson Education, 2004. 4. Debaprasad Das, VLSI Design, Oxford University Press, 2010 5. Christophn Meinel & Thorsten Theobold, "Algorithm and Data Structures for VLSI Design", KAP, 2002. 6. Rolf Drechsheler : "Evolutionary Algorithm for VLSI", Second edition. 7. Internet of Things, Vasudevan, Nagrajan and Sundaram, Wiley India 8. IoT Fundamentals, David Hence at el, Cisco Press 9. 21 IoT Experiments, Yashavant Kanetkar, Shrirang Korde, BPB 10. IoT Based Projects, Rajesh Singh at el, BPB 11. Internet of Things with ARDUINO and BOLT, Ashwin Pajankar, BPB 12. Star Expert IoT Specialist, STAR CERTIFICATION
Evaluation	Total – 100 CIA – 20 Semester Examination – 80