IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science& Engineering

Bachelor of Technology(B.Tech.)[Computer Science & Engineering (IoT)]

VI Semester

Sr. No.	Course Type	Course Code	Course Title	Scheme			Credits
				L	T	P	
1	PCC	IO12	Cyber Security	2	1	–	3
2	PCC	IO13	Compiler Design	2	1	–	3
3	PCC	IO14	Embedded System & Robotics	2	1	–	3
4	HSMC	HS06	Humanities and Social Sciences Open Courses - II	2	–	–	2
5	PEC	IO01	Professional Elective-I	3	–	–	3
6	IOC	-	Interdisciplinary Open Course-I	3	–	–	3
7	LC	IO14(P)	Embedded System & Robotics Lab	–	–	2	1
8	PROJ	IO02	Minor Project	–	–	4	2
9	PROJ	IO03	Evaluation of Internship-I	–	–	4	2
10	LLC	LLC03	Liberal Learning Course –III	–	–	2	1
11	MLC	MLC04	Intellectual Property Rights	1	–	–	Audit*
12	PROJ	–	Internship-II	Credit to be added in Seventh Semester.			
Total Academic Engagement and Credits				**15**	**3**	**12**	**23**
				30			

*****Zero credit course

- **Professional Elective–I**

(A) IoT Architecture and its Protocol
(B) Augmented and Virtual Reality
(C) Adhoc & Wireless Sensor Network
(D) Information Storage Management

- **Interdisciplinary Open Course-I**

MA-01(A) Scientific Aptitude
(B)Operation Research
(C)Robotics
(D)Industrial Electronics

- **Humanities and Social Sciences Open Courses – II, HS06 (Any One Course)**

(A) Industrial Safety Psychology
(B) Project Management
(C) Business Communication

Liberal Learning Course-III, LLC03 (Any One Course from NCC/NSO/NCA)
Note: pool of choices will be the same as in LLC01 and LLC02.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PCC-IO-12	Cyber Security	2L:1T:0P (3hrs.)	3 Credits

Pre-requisite: None.

Course Objective: Analyze and resolve security issues in an organization to secure an IT infrastructure.

Course Contents: (40hrs)

Module 1: (06hrs.)
Introduction of Cyber Crime, Challenges of cyber crime, Classifications of Cybercrimes: E- Mail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique.

Module 2: (08hrs.)
Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime, Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers were hacking, session hijacking.

Module 3: (10hrs.)
Cyber Crime and Criminal justice: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and E-mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies to tackle Cyber Crime and Trends.

Module 4:(10hrs.)
The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

Module 5: (06hrs.)
Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Keyloggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks, Buffer and Overflow, Attack on Wireless Networks, Phishing: Method of Phishing, Phishing Techniques. Introduction to KALI Linux.

Course Outcome:

1. Define and explain the concepts of cyber crime and its classification.
2. Delineate the components online frauds, intrusions, virtual crimes and hacking.
3. Knowledge of different acts in cyber security.
4. List the various parts of IT act related to electronic records.
5. Knowledge of different Cyber Security tools.

List of Text/ Reference Books:

1. Jonathan Clough, "Principles of Cyber crime", Cambridge University Press,2nd Edition, 2015.
2. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Charles River Media, 2nd Edition, 2005.
3. Vivek Sood "Cyber Law Simplified",TMH, 2001.
4. Nina Godbole, Sunit Belapure, "Cyber Security", Wiley-India
5. William Hutchinson, Mathew Warren, "Information Warfare: Corporate attack and defense in digital world" , Elsevier, Reed International and Professional Publishing Ltd,2001.
6. Harish Chander, "Cyber Laws and IT Protection", Prentice Hall India Learning Private Limited, 2012.

Perspectives:

1. Computer security, cyber security or any other related terminology is the protection of computers from any harm or damage, either physical or otherwise, by unauthorized users.
2. Cyber Security is a very broad term but is based on three fundamental concepts known as "The CIA Triad". It consists of Confidentiality, Integrity, and Availability.
3. Cyber Security study programmers teach you how to protect computer operating systems, networks, and data from cyber-attacks.
4. Confidentiality, honesty, and availability are three basic security principles that are essential for information on the internet.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PCC-IO-13	Compiler Design	2L:1T:0P (3hrs.)	3 Credits

Pre-requisite: Theory of Computation.

Course Objective: To explain the different stages in the process of compilation.

Course Contents: (40 hrs.)

Module1: (06hrs.)

Introduction to compiling & Lexical Analysis

Introduction of Compiler, Major data Structure in compiler, types of Compiler, Front-end and Back- end of compiler, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Single & Multipass Compiler, Lexical analysis: Input buffering, Specification & Recognition of Tokens, Design of a Lexical Analyzer Generator, LEX.

Module2: (15hrs.)

Syntax Analysis & Syntax Directed Translation

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR),Parser generation. Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Module3: (6hrs.)

Type checking: type system, specification of simple type checker, equivalence of expression, types, type conversion, overloading of functions and operations, polymorphic functions. Runtime Environment: storage organization, Storage allocation strategies, Parameter passing, dynamic storage allocation, Symbol table, Error Detection & Recovery.

Module4: (06hrs.)

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements, back patching, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks, peephole optimization, and generating code from DAG.

Module5: (07hrs.)

Introduction to Code optimization: sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations, Data flow analysis of structure flow graph Symbolic debugging of optimized code.

Course Outcome:

1. Understand the overview of phase of compiler and Lexical analysis.
2. Design and implement various parsing techniques of compiler.
3. Apply type checking for semantic analysis and analyze Runtime environment.
4. Design and implement different intermediate code generation techniques.
5. Analyze various code optimization techniques.

List of Text/ Reference Books:

1. A.V. Aho, R. Sethi, and J. D. Ullman. "Compilers: Principles, Techniques and Tools", Pearson Education,2nd Edition, 2007.
2. V Raghavan, "Principals of Compiler Design", TMH Pub., 2017.
3. Louden. "Compiler Construction: Principles and Practice", Cengage Learning,1997.
4. A. C. Holub. "Compiler Design in C", Prentice-Hall Inc., 1993.
5. Ronald Mak, "Writing compiler & Interpreters", Willey Pub.,3rd Edition, 2009.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PCC-IO-14	Embedded System and Robotics	2L:1T:0P (3hrs.)	3 Credits

Pre-requisite: Fundamentals of microprocessors, microcontrollers, programming and interfacing.

Course Objective: This course will enable the students to:

1. Understand the basics of an embedded system.
2. Understand the typical components of an embedded system.
3. To understand different communication interfaces.
4. To learn the design process of embedded system applications.

Course Contents: (40 hrs.)

Module1: (08hrs.)

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Module2: (08hrs.)

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems.

Module3: (08hrs.)

Introduction Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces Relays and their types, Specifications and characteristics of Stepper motors ,AC motors, DC motors and servo motors. Power driving circuit and Power management for actuators, Torque and speed relationship of motors, Motor speed controlling techniques.

Module4:(08hrs.)

Introduction to Robotics, Types and components of a robot, Classification of robots, Kinematics systems; Definition of mechanisms and manipulators, Degrees of Freedom. Elements of Robotic Systems i.e. Robot anatomy, Classification, Associated parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device, etc. Robotics and Automation for Industry 4.0.

Module5: (08hrs.)

Introduction to Assembly and Embedded C. Introduction to Atmega328p Timer Module and it's Modes of Operation. Generating Pulse Width Modulation (PWM) using Timer Capture Mode. ADC operation in atmega328p Interfacing analog inputs. Interfacing of LED, LCD, 7 segment display, motor driver, ADC, DAC, memory, timers, delays, keyboard, GSM.

Course Outcome:

Students should be able to:

1. Understand the fundamentals and history of embedded system design.
2. Understand typical embedded System & its components.
3. Understand the concept of sensor and Actuators used in embedded system and robotics.
4. Understand Robots and its various aspects.
5. Able to design and develop embedded systems by interfacing different Modules with advance controllers.

Text/Reference Books:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. AVR Microcontroller and Embedded Systems using Assembly and C- M.A. Mazidi, S Naimi
4. An Embedded Software Primer - David E. Simon, Pearson Education.
5. Phillip John Mc Kerrow, "Introduction to Robotics",1 st edition, Paperback.
6. Dr. Kevin Klein, "Robotics: Discover the Robotic Innovations of the Future- An Introductory Guide to Robotics",1st edition, Paperback, 2016.
7. Muhammad Ali Mazidi, "PIC Microcontroller and Embedded Systems: Using assembly and C for PIC 18", 1st edition, Pearson, 2008.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PEC-IO-01(A)	**IoT Architecture and Protocol**	**3L:0T:0P (3hrs.)**	**3 Credits**

Prerequisite: Basic Electronics.

Course Objective:

1. To impart knowledge on the infrastructure, sensor technologies and networking technologies of Internet of Things.
2. To analyze, design and develop solutions for Internet of Things.
3. To explore the real-life aspects of Internet of Things.

Course Contents: (40 hrs.)

Module 1: (06hrs.)

IoT Fundamentals-Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

Module 2: (08hrs.)

IoT Protocols: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

Module 3: (10hrs.)

Design and Development: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details.

Module 4: (10hrs.)

Data Analytics and Supporting Services: Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

Module 5: (06hrs.)
IoT case Studies/ Industrial Applications: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts.

Course Outcome:
On successful completion of the course, the student will be able to:

1. Understand the basics of IoT.
2. Implement the state of the Architecture of an IoT.
3. Understand design methodology and hardware platforms involved in IoT.
4. Understand how to analyze and organize the data.
5. Compare IOT Applications in Industrial & real world

List of Text/Reference Books:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Author(s) David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Publisher Cisco Press, 2017.
2. Internet of Things – A hands-on approach, Author(s) Arshdeep Bahga, Vijay Madisetti, Publisher
   Universities Press.
3. The Internet of Things – Key applications and Protocols, Author(s) Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley Publisher, Tata McGraw-Hill Education.
4. Object-Oriented Analysis and Design with Applications, Third Edition, Author(s) Grady Booch, Robert A. Maksimchuk Michael W. Engle, BobbiJ.Young, Ph.D., Jim Conallen, Kelli A. Houston, Publisher Tata McGraw-Hill Education.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PEC-IO-01(B)	**Augmented and Virtual Reality**	**3L:0T:0P (3hrs.)**	**3 Credits**

Prerequisite: Basic Programming Skills.

Course Objective

1. To gain the knowledge of historical and modern overviews and perspectives on virtual reality.
2. To learn the fundamentals of sensation, perception, and perceptual training.
3. To have the scientific, technical, and engineering aspects of augmented and virtual reality systems.
4. To learn the Evaluation of virtual reality from the lens of design.
5. To learn the technology of augmented reality and implement it to have practical knowledge.

Course Contents: (40 hrs.)

Module 1: (06hrs.)

Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR, VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.

Module 2: (11hrs.)

VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays

Module 3: (11hrs.)

Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.

Module 4: (06hrs.)

Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR).

Module 5:(06hrs.)

3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation.

Course Outcome:

After the completion of this course, the students will be able to:

1. Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.
2. Describe how VR and AR systems work.
3. Choose, develop, explain, and defend the use of particular designs for AR and VR experiences.
4. Evaluate the benefits and drawbacks of specific AR and VR techniques on the human body.
5. Identify and examine state-of-the-art AR and VR design problems and solutions from the industry and academia.

List of Text/Reference Books:

1. George Mather, Foundations of Sensation and Perception: sychology Press; 2 editions, 2009.
2. The VR Book: Human-Centered Design for Virtual Reality, by Jason Jerald.
3. Learning Virtual Reality by Tony Parisi, O' Reilly.
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kafmnn, 2013.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PEC-IO-01(C)	**Ad hoc and Wireless Sensor Networks**	**3L:0T:0P (3hrs.)**	**3 Credits**

Pre-requisite: Computer Networking and Protocol Basics.

Course Objective: The objective of this course is to learn Adhoc network and Sensor Network fundamentals and have an in-depth knowledge on sensor network architecture and design issues.

Course Contents: (40hrs.)

Module 1: (09hrs.)

ADHOC NETWORKS INTRODUCTION AND ROUTING PROTOCOLS: Elements of Adhoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols - Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

Module2: (08hrs.)

SENSOR NETWORK INTRODUCTION & ARCHITECTURES: Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single- Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture - Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

Module3: (09hrs.)

WSN NETWORKING CONCEPTS AND PROTOCOLS: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

Module4: (08hrs.)

SENSOR NETWORK SECURITY: Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

Module5: (06hrs.)

SENSOR NETWORK PLATFORMS AND TOOLS 9 Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

Course Outcome:

1. Describe the basics of Adhoc networks and Wireless Sensor Networks.
2. Apply this knowledge to identify the suitable routing algorithm based on the network and user requirements.
3. Apply the knowledge to identify appropriate physical and MAC layer protocols.
4. Understand the transport layer and security issues possible in Ad hoc and sensor networks.
5. Familiar with the OS used in Wireless Sensor Networks and build basic modules.

List of Text/ Reference Books:

1. C. Siva Ram Murthy and B. S. Manoj, ―AdHoc Wireless Networks Architectures and Protocols, Prentice Hall, PTR, 2004.

2. Holger Karl, Andrea Willig, Protocol and Architecture for Wireless Sensor Networks, John wiley publication, Jan 2006.

3. Feng Zhao, Leonidas Guibas,―Wireless Sensor Networks: an information processing approach, Elsevier publication, 2004.

4. Charles E.Perkins ,―AdHoc Networking, Addison Wesley, 2000.

5. I. F. Akyildiz, W. Su, Sankara subramaniam, E. Cayirci,―Wireless sensor networks: a survey, computer networks, Elsevier, 2002.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PEC-IO-01(D)	**Information Storage and Management**	**3L:0T:0P (3hrs.)**	**3 Credits**

Pre-requisite: Basic understanding of Computer Architecture, Operating Systems.

Course Objective: To introduce solutions available for data storage, Core elements of a data center infrastructure, role ofeach element in supporting business activities.

Course Contents: (40 hrs.)

Module 1: (08 hrs.)

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

Module 2: (08hrs.)

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integratedvs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Module 3: (08hrs.)

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison. Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

Module 4:(08hrs.)

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

Module 5:(08hrs.)

Information storage on cloud : Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Course Outcomes:

After the completion of this course, the students will be able to:

1. To Understand the Concept of Information Storage and Data centre Environment.
2. 2.To understand about Data Protection.
3. To Understand Fiber Channel SAN.
4. To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
5. To Understand Cloud Computing.

List of Text / Reference Books:

1. G. Somasundaram & Alok Shrivastava (EMC Education Services) editors, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley India, 2009.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein, "Storage Network explained : Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE", Wiley India.
3. John W. Ritting house and James F. Ransome, "Cloud Computing: Implementation, Management andSecurity", CRC Press, Taylor Frances Pub.1st Edition, 2017.
4. Nick Antonopoulos, Lee Gillam, "Cloud Computing : Principles, System &Application", Springer.
5. Anthony T. Velete, Toby J.Velk, and Robert Eltenpeter, "Cloud Computing: A practical Approach", McGraw-Hill Education (India) Pvt Limited, 2009.
6. Dr. Kumar Saurabh , "Cloud Computing : Insight into New Era I", Wiley India Pvt. Limited, 2011.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

LC-IO-14	Embedded System and Robotics Lab	0L:0T:2P (2hrs.)	1 Credit

Pre-requisite: Fundamentals of microprocessors, microcontrollers, programming and interfacing**.**

Course Objective:

This course will enable the students to:

1. Understand the basics of an embedded system.
2. Understand the typical components of an embedded system.
3. To understand different communication interfaces.
4. To learn the design process of embedded system applications.

Module 1: (04hrs.)

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems.

Module 2: (04hrs.)

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors and their interfacing.

Module 3: (04hrs.)

Introduction Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Module 4:(04hrs.)

Introduction to Robotics, Types and components of a robot, Classification of robots, Kinematics systems Robotics and Automation for Industry 4.0.

Module 5: (06hrs.)

Introduction to Assembly and Embedded C. Introduction to Atmega328p Timer Module and it's Modes of Operation. Interfacing of LED, LCD, 7 segment display, motor driver, etc.

Course Outcome:

On completion of this course the students will be,

1. Understand the fundamentals and history of embedded system design.
2. Understand typical embedded System & its components.
3. Understand the concept of sensor and Actuators used in Embedded system and robotics.
4. Understand Robots and its various aspects.
5. Able to design and develop embedded systems by interfacing different Modules with advance controllers.

Text/Reference Books:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. AVR Microcontroller and Embedded Systems using Assembly and C- M.A. Mazidi, S Naimi
4. An Embedded Software Primer - David E. Simon, Pearson Education
5. Phillip John Mc Kerrow, “Introduction to Robotics”,1 st edition, Paperback.
6. Dr. Kevin Klein, “Robotics: Discover the Robotic Innovations of the Future- An Introductory Guide to Robotics”,1st edition, Paperback, 2016.
7. Muhammad Ali Mazidi, “PIC Microcontroller and Embedded Systems: Using assembly and C for PIC 18”, 1st edition, Pearson, 2008.

List of Experiments:

(Using AVR Studio)

1. Write a program in embedded C to read temperature by LM35 and display on LCD.
2. Write a program in embedded C to interface a simple Switch and display its status through Relay, Buzzer and LED.
3. Write a program in embedded C to control speed of motor.
4. Write a program in embedded C to interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
5. Write a program in embedded C to control IR sensor.
6. Interface 12-bit internal ADC to convert the analog to digital and display the same on LCD.

(Using robotic software)

1. Code a sequence in Robotic software to pick and place an object by Robotic hand.
2. Code a sequence in Robotic software to control hands of a humanoid Robot.
3. Code a sequence in Robotic software to control legs of a humanoid Robot.
4. Code a sequence in Robotic software to make a Robot walk.
5. Code a sequence in Robotic software to make a Robot dance.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PROJ-IO-02	Minor Project	0L:0T:4P (4hrs.)	2 Credit

Pre-requisite: Knowledge of subjects of respective stream.

Course Objective: To develop ability in the students to apply some of the theoretical concepts and programming knowledge, in real life engineering problems.

Course outcome:

1. Acquire practical knowledge within the chosen area of technology for project development.
2. Identify, analyze and handle programming projects with a comprehensive and systematic approach.
3. Contribute as an individual or in a team in development of technical projects.
4. Develop effective communication skills for presentation of project related activities.
5. Formulate and propose a plan for creating a solution for the problems identified.
6. Report and present the finding of the study conducted in the preferred domain.

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (IoT)]

VI-Semester

PROJ-IO-03	**Evaluation of Internship-I**	**0L:0T:4P (4hrs.)**	**2 Credits**

Prerequisite: Nil.

Course Objective:

The primary purpose of doing an academic internship is to better understand the theories, ideas, and practices of discipline or major by actively engaging in a "hands-on," work-based, learning experience.

Course Outcome:

1. To explore career alternatives prior to graduation.
2. To Develop communication, interpersonal and other critical skills in the job interview process.
3. To Assess interests and abilities in their field of study.
4. To Identify, write down, and carry out performance objectives related to their job assignment
5. To Integrate theory and practice.