

SI No.	Course name	TOC	Duration (hours)
1	Introduction to IoT	<ul style="list-style-type: none"> Internet of Things and the New Dimension of Connectivity IoT from an Embedded Systems Point of View Nanotechnology and Industry 4.0 Industrial IoT and Consumer IoT The Characteristics, Applications, and Benefits of IoT Technologies that have Supported IoT Growth THING Architecture Layers of IoT (Architectural View) Sensing/Actuation and Information Processing M2M and IoT IoT Functional Blocks Essential Features of Raspberry Pi and Arduino Standards: National and International Scenario 	20 hours
2	Embedded Computing for IoT Systems	<ul style="list-style-type: none"> Introduction to Embedded Systems ARM Cortex-M4 Processor Architecture – Part I ARM Cortex-M4 Processor Architecture – Part II Implementation of C Code in Assembly Language Interrupts Low Power Requirements 	15 Hours
3	Embedded Sense for IoT Systems	<ul style="list-style-type: none"> Software Engineering for Embedded Systems Concurrency General Purpose Input Output (GPIO) Analog Interfacing Timers Serial Communication DMA: Dynamic Memory Access Programming Techniques for Power efficient computing 	10 Hours
4	Embedded Linux for IoT Systems	<ul style="list-style-type: none"> Introduction to Linux Introduction to Operating System Introduction to Kernel Linux commands and File Permissions Customizing Embedded Linux Processes and Signals Threads Single and Multi-Core Systems Process Synchronization Inter-process Communication Pipes and Queues File System Memory Management 	20 Hours
5	Cloud Computing for IoT Systems	<ul style="list-style-type: none"> Introduction to Cloud Computing Characteristics of cloud computing Software Virtualization Containerizing applications Virtual Machine Provisioning & Manageability Cloud Deployment models Cloud service models: PaaS, SaaS, IaaS Introduction to IoT Platform Cloud IoT Architecture IoT Cloud Services Identity & Device Management Introduction to Dashboards & Web portals Introduction to Google, AWS and Azure IoT core services Business & Technical considerations for choosing the right IoT Cloud Platform 	15 Hours
6	Mobile Application Development	<ul style="list-style-type: none"> Introduction to Mobile Application Development Popular Mobile Platforms and their Programming Environment Google's Android OS Architectural overview of Android OS Introduction to Apple's iOS Cross Platform Applications Ionic App Core Building Blocks Ionic Components Web Design Basics Hyper Text Mark-up Language or HTML Basics of Cascaded Style Sheet or CSS Basics of JavaScript Basics of TypeScript REST API Design Principles 	30 hours

Sl No.	Course name	TOC	Duration (hours)
7	Communication Models and Protocols for IoT Systems	<ul style="list-style-type: none"> Introduction to IoT Protocols Introduction to Edge Computing MQTT: Message Queue Telemetry Transport RESTful Design in IoT IoT Protocol Stack & CoAP IoT Application Layer Protocol: CoAP Basics of WebSockets IoT Gateway Design and Characteristics Protocol Bridging HTTP CoAP IoT Protocol Convergence 	30 hours
8	Wireless Sensors Networks for the Internet of Things (Part I)	<ul style="list-style-type: none"> Introduction to Networking Layered Architecture – OSI Model to TCP/IP Model Network and Internet Protocol Addressing Subnet & Supernet Packet Header Structure TCP - Transmission Control Protocol and UDP – User Datagram Protocol Clustering and Routing IEEE 802.15.4 Architecture of ZigBee Application Framework ZigBee Device Object (ZDO) 6LoWPAN and Architecture of 6LoWPAN Networking Mobility Application Protocols Hardware Platforms and Software Stacks 	15 Hours
9	Wireless Sensors Networks for the Internet of Things (Part II)	<ul style="list-style-type: none"> Bluetooth Short Range Wireless Technology Bluetooth Low Energy Wi-Fi RTS and IoT Cellular Technologies GSM Other IoT technologies RFID, NFC, and GPS 	16 Hours
10	Embedded Systems with Drones	<ul style="list-style-type: none"> Introduction to Embedded Systems ARM Cortex-M4 Processor Architecture I Interrupts General Purpose Input Output (GPIO) Analog Interfacing Timers Serial Communication Bonus chapter: Programming Techniques for Power-efficient computing Drone Experiments Bonus Labs with STM-Nucleo Kit Online Course Embedded systems for Drones 	20 Hours
11	IoT - Python for Everyone	<ul style="list-style-type: none"> Introduction to Python Strings, Lists, Tuples, and Dictionaries Functions, Modules, Files, and Exceptions Oops Concepts 	6 Hours
12	IoT - C Programming	<ul style="list-style-type: none"> Introduction to C Programming Data types Control Statements Functions Arrays & Pointers Strings Structures and Unions Structures and Unions - Updated Pre-processors Dynamic Memory Allocation Data Structures Linked Lists Data Structures (contd) Searching Algorithms Node-JS & Node-Red 	8 Hours

SI No.	Course name	TOC	Duration (hours)
13	Static Timing Analysis for VLSI Engineers-GA01	<ul style="list-style-type: none"> Introduction to Timing Analysis Basic Terminologies used in STA Basics of Timing Analysis - Part I Basics of Timing Analysis - Part II Clocks and their Characteristics Timing Exceptions and Back Annotation PVT Variations and their Effect on Timing Understanding Timing Reports - Part 1 Understanding Timing Reports - Part 2 Introduction to Effect of Clock Skew on Timing and Fixing Timing Violations Advanced Concepts in STA - Part I Advanced Concepts in STA - Part II 	40 hours
14	RTL Verification using Verilog-GA02	<ul style="list-style-type: none"> Introduction to RTL verification Evolution of verification process Overview of basic concepts and terminology Introduction to a test bench Introduction to verification planning Development of a verification plan for an Arithmetic Logic Unit (ALU) Test bench development and simulation Running the test bench on an RTL simulator (demo) Overview of advanced terminologies and concepts Advances in RTL verification 	40 hours
15	RTL Design using Verilog HDL-GA01	<ul style="list-style-type: none"> Introduction to digital design using HDLs Definitions and commonly used terminologies Overview of frequently used Verilog constructs Hardware inference of Verilog code General coding guidelines in Verilog Modeling FSMs and memories in Verilog Evolution of Verilog standards Deliverables of an RTL design engineer 	45 Hours
16	Logic Design for VLSI Engineers-GA02	<ul style="list-style-type: none"> Combinational and Sequential Circuit Design techniques Timing parameters for digital logic gates and flip-flops Glitches and hazards in combinational circuits Combinational circuit design techniques Sequential circuit design techniques Finite State Machines (FSM) Introduction to Memories 	30 Hours
17	Advanced Verification using SystemVerilog - Corporates Only-GA01	<ul style="list-style-type: none"> Introduction to SystemVerilog Commonly Used terminologies in SystemVerilog Data Types Object Oriented Programming (OOP) Concepts The SV Stratified Event Queue/Scheduler Verification Planning and SV Testbench Architecture Tasks and Functions Verification Specific SV constructs Modeling Transactors Functional Coverage Verification Plan and SystemVerilog Testbench Architecture Modeling Testbench Blocks* Assertions Universal Verification Methodology (UVM) 	50 hours
18	ASIC Design Flow - GA03	<ul style="list-style-type: none"> Introduction to ASIC Design Flow Terminologies Associated with ASIC Design Specification Overview of RTL Design RTL Verification Logic Synthesis Design for Testability Logical Equivalence Check Pre-layout Static Timing Analysis Automatic Place and Route Parasitic Extraction and Back-annotation Post-layout STA Physical Verification DFM, Antenna Checks, and Tapeout 	45 hours

Sl No.	Course name	TOC	Duration (hours)
19	Introduction to Electromagnetic Compatibility	Preamble of EMI & EMC Sources of EMI EMI-EMC Standards EMI-EMC Measurements-I Designing for EMC EMI Control Techniques-I System Level EMC EMC Checklist/Summary EMI-EMC Test Facilities	30 hours
20	Advanced Aspects of Electromagnetic Compatibility	Introduction to EMC EMI Physics EMI-db Measurement EMC Analysis & Prediction EMC References & Problems Understanding the Problem EMC Design Standards and Specifications EMI Transients, ESD, and EFT EMI Filter Design Grounding and Bonding EMC Design Aspects EMC in Automotive Electronics Shielding Design	30 hours
21	Machine Learning	Python Programming using NumPy, Pandas, Scikit-learn, and Matplotlib Linear Regression, Logistic Regression, and Least Squared Method Overfitting, Under-fitting, and its Prevention Techniques Regularization and its Techniques Anomalies and Anomaly Detection Natural Language Processing (NLP) Sentence Segmentation, Tokenization, Stemming and Lemmatization Dependency Parsing, POS Tagging and Named Entity Recognition Libraries like spaCy and NLTK with Hands on Example Matrix Factorization Approach Neural Networks, Artificial Neural Networks (ANN), and Convolutional Neural Networks (CNN) Autoencoders, Image Analysis and its Applications ResNet 50 and Residual Mapping K-Means Clustering, Hierarchical Clustering, and Density Based Clustering Dimension Reduction and its Types Statistics in Machine Learning Parametric Tests and Non-Parametric Tests Pearson Correlation Coefficient and Z-Test ANOVA and Spearman's Rank Correlation Hands-on Examples for all of the above	15 hours
22	Building Wireless Community Networks 2.0	Wireless Networking Standards – IEEE Radio Physics Practical Planning for Implementing a Wireless Network The Network Layer Unicast, Multicast and Broadcast Addresses Routing, Web Proxies, and IP Tunnelling Network Topologies and Infrastructure Internet of Things (IoT) and Wireless Networking Protocols ZigBee and Use Cases NFC Categories and Properties Innovations in Wireless Networking Wi-Fi 5 and Wi-Fi 6 Radio Device Configuration SSID (Service Set Identifier) Request-to-send (RTS) / Clear-to-send (CTS) Access Control through MAC filtering Encryption and Restricted Access Through Authentication How to Make Wireless Networks Secure Sniffing, Spoofing and Session Hijacking Denial of Service Troubleshooting a Wireless Network Bottom-up, Top-down, and Middle-top/down Troubleshooting Software Tools and Utilities for Troubleshooting	15 hours

Sl No.	Course name	TOC	Duration (hours)
23	Introduction to Blockchain	Introduction Origins of Blockchain technology Features of Blockchain technology Architectures that the Blockchain technology supports Applications of Blockchain technology	3 hours
24	Introduction to Innovation Management and Intellectual Property	Introduction to Intellectual Property Rights Different Forms of IP Patents - Introduction Patentability: Eligibility Criterias Patent Application Patent Registration process Trademarks - Introduction Creating a strong brand name Trademark Registration Trademark: Key concepts Introduction to Copyright Protection Which artistic expressions are protected under Copyright? Key concepts - Copyright (Important Rights of Copyright Owners Authors) Introduction to Industrial Design Registration of Industrial Design IP Protection: Idea Stage to Commercialization Innovation Management	5 hours
25	Innovation Management and Intellectual Property Advance	Introduction General Concepts of Intellectual Property Trademark Patents Copyright Industrial Design Other Forms of IP Innovation Management IP Commercialization	5 hours
26	Prevention of Sexual Harassment (POSH)	STUDENT AND EMPLOYEE 1. Introduction to the module 2. Who may file a complaint? 3. What is Sexual Harassment? 4. Types of Sexual Harassment 5. Defining workplace - Where can Sexual Harassment 6. Complaint Mechanism : Conciliation 7. Complaint Mechanism : Inquiry 8. Interim Redressal 9. False Complaint 10. Confidentiality 11. Concluding the module with a quick recap 12. Final Test EXECUTIVE AUTHORITY 1. Introduction to the online module 2. Defining Executive Authority 3. Responsibilities of the Executive Authority and Higher Educational Institution 4. Supportive measures of the Executive Authority 5. Constituting an Internal Committee (IC), key functions of IC and removal of IC member. 6. Taking action as per recommendation 7. Interim Relief 8. Action and compensation 9. Consequence of non-compliance	3 hours

27	Introduction to Cybersecurity	<ol style="list-style-type: none"> 1. Overview of Cybersecurity 2. Creating your own Lab Environment 3. Logical Security and types of Threats 4. Cybersecurity Core Concepts 5. Various processes for Cybersecurity 6. Complementary technologies and Tools for Cybersecurity 7. Introduction to Penetration Testing (Pen Testing) 8. Cybersecurity Frameworks 9. Network Security 10. Mobile Security 	8 Hours
28	Cybersecurity (NSQF aligned)	<ol style="list-style-type: none"> 1. Cyber Hygiene with Law 2. Cryptography and PKI Algorithm 3. AES and PKI Algorithms 4. Digital Signatures 5. PKCS standards 6. OSCP 7. SSL 8. eSign 9. Authentication Protocols 10. Linux Fundamentals and Basic commands 11. Linux File System and Permissions 12. File System Management and Partitioning 13. Disk Quota Management 14. Linux User Administration and Package Management 15. Linux Services Management 16. Domain Name System 17. Web Server 18. Linux Security 19. Fundamentals of Windows Operating System 20. Windows Active Directory 21. Windows File System management 22. Windows Security 23. Introduction to Ethical Hacking 24. First Phase of Ethical Hacking - Reconnaissance 25. Second Phase of Ethical Hacking - Scanning and Enumeration 26. Network Sniffing 27. Third Phase - Gaining Access 28. Exploitation in LAN Environment 29. Password Cracking 30. Denial of Service Attack 31. WiFi Exploitation 32. Web Application Security 33. SQL Injection Attack 34. Cross Site Scripting- XSS 	280 Hours
29	Cybersecurity - A hands on guide (Lab components)	<ol style="list-style-type: none"> 1 FUNDAMENTALS OF CYBER SECURITY 2. ENTERPRISE CYBER SECURITY ORGANISATION 3. NETWORK SECURITY 4 APPLICATION SECURITY 5 MOBILE DEVICE AND WIFI SECURITY 6 DATA SECURITY 7 MALWARE ATTACK AND PREVENTION 8 SECURITY REVIEW AND TESTING 9 CYBER SECURITY MANAGEMENT 10 EMERGING TECHNOLOGIES 	40 Hours
30	Cybersecurity School Hygiene Program	<ol style="list-style-type: none"> Cyber Security & Threat Landscape 2. Overview of a Computer Network, 3. Securing your IT devices – desktops, laptop, pads and mobiles 4. How to remain safe On-Line and keep children safe 5. Information security best practices 6. Debunking some Myths – Dos and Don't's 	4 Hours