WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

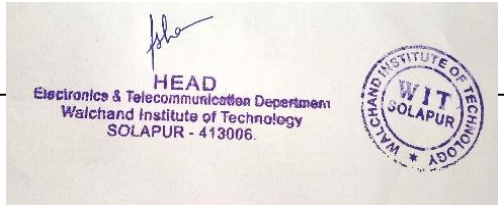
Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Tech. Electronics and Telecommunication Engineering

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus for
Honors Degree in
Internet of Things

S.Y. B. Tech. Electronics and Telecommunication Engineering W.E.F. 2022-23
T.Y. B. Tech. Electronics and Telecommunication Engineering W.E.F. 2023-24
Final Year B. Tech Electronics and Telecommunication Engineering W.E.F. 2024-25



Electronics and Telecommunication Engineering Department

Department Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the electronics and allied field.

Department Mission

1. To inculcate and stimulate Electronics & allied Engineering proficiency amongst students through quality education and innovative educational practices.
2. To create engineering professionals with social consciousness.
3. To foster technical skills of students through creativity and critical thinking.
4. To enhance soft skill set of students which is crucial for career success through effectual training.

Electronics and Telecommunication Engineering
Under Graduate Program
Program Educational Objectives (PEOs)

1. Graduates will exhibit strong fundamental knowledge and technical skills in Electronics and Telecommunication Engineering and allied fields.
2. Graduates will manifest technological progression, hardware & software skills to fabricate sustainable, energy efficient and futuristic solutions to pursue successful professional careers in multidisciplinary fields.
3. Graduates will demonstrate professional ethics, effective communication, teamwork, leadership qualities and ability to relate engineering issues to broader social context along with lifelong learning.

Program Outcomes (POs)

The program outcomes of B. Tech. E&TC Engineering Program are summarized as following:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities, relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering graduate in Electronics and Telecommunication Engineering Programme will be able to do-

1. Graduates will be able to attain a solid foundation in Electronics and Telecommunication Engineering with an ability to function in multidisciplinary environment.
2. Graduates will be able to use techniques and skills to design, analyze, synthesize, and simulate Electronics and Telecommunication Engineering components and systems.
3. Graduate will be capable of developing programs in Assembly, High level and HDL languages using contemporary tools for software development.

Legends used–

L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B.Tech.	Bachelor of Technology

Course Code Format for Honors:

2	1	E	T	U/P	2	H	A	1	T / L
Batch Entry Year		Program Code		U-Under Graduate, P-Post Graduate	Semester No. / Year 1/2/3/…8	Honors Code		Course Serial No. 1-9	T-Theory, L-Lab session A- Tutorial P-Programming/ Drawing / Design

Program Code	
ET	Electronics and Telecommunication Engineering
Honors Code	
HI	Honors in Internet of Things (IoT)

Sample Course Code:

21ETU4HI1T	Fundamentals of IoT

Walchand Institute of Technology, Solapur
Electronics and Telecommunication Engineering
Honors in Internet of Things (IoT)

Structure of S. Y. B. Tech. Electronics and Telecommunication Engineering.,
(W.E.F. 2022-2023)

Semester- IV

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		
		L	T	P		ESE	ISE	ICA	Total
21ETU4HI1T	Fundamentals of IoT	3	-	-	3	60	40		100
21ETU4HI1A	Fundamentals of IoT		1		1			25	25
	Grand Total	**3**	**1**		**4**	**60**	**40**	**25**	**125**

Walchand Institute of Technology, Solapur
Electronics and Telecommunication Engineering
Honors in Internet of Things (IoT)

Structure of T. Y. B. Tech. Electronics and Telecommunication Engineering., (W.E.F. 2023-2024)

Semester- V

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		
		L	T	P		ESE	ISE	ICA	Total
21ETU5HI1T	IoT Cloud Platform	3			3	60	40		100
	Laboratory:								
21ETU5HI1L	IoT Cloud Platform Lab			2	1			25	25
	Grand Total	**3**		**2**	**4**	**60**	**40**	**25**	**125**

Structure of T. Y. B. Tech. Electronics and Telecommunication Engineering., (W.E.F. 2023-2024)

Semester- VI

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		
		L	T	P		ESE	ISE	ICA	Total
21ETU6HI1T	Industrial IoT	3			3	60	40		100
	Laboratory:								
21ETU6HI1L	Industrial IoT Lab			2	1			25	25
	Grand Total	**3**		**2**	**4**	**60**	**40**	**25**	**125**

Walchand Institute of Technology, Solapur
Electronics and Telecommunication Engineering
Honors in Internet of Things (IoT)

Structure of Final Year B. Tech. Electronics and Telecommunication Engineering., (W.E.F. 2024-2025)

Semester- VII

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		
		L	T	P		ESE	ISE	ICA	Total
21ETU7HI1T	Architecting IoT Solutions	3			3	60	40		100
	Laboratory:					**OE**			
21ETU7HI1L	Architecting IoT Solutions Lab			2	1			25	25
21ETU7HI2L	Mini project			4	2	50		50	100
	Grand Total	**3**		**6**	**6**	**110**	**40**	**75**	**225**

Note: -These courses are to be completed by the student in addition to the courses of B. Tech Electronics & Telecommunication Engineering

Walchand Institute of Technology, Solapur

Honors in Internet of Things

S.Y.B.Tech. (Electronics & Telecommunication Engineering), Semester-IV

21ETU4HI1T – Fundamentals of IoT

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Tutorial: 1 hr/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks

The Internet of Things (IoT) refers to the system in which different devices equipped with sensors and signal processing are connected through a network to communicate with each other and/or with central servers. This course provides a thorough introduction to the different components of an IoT System. The course also introduces cloud platforms of IoT and different communication protocols. Introduction to ESP8266 and its architecture is also a part of this course.

Course Prerequisite:

Students must have completed a course in microcontroller and interfacing and have adept knowledge of assembly and C language programming. Students also have knowledge of interfacing techniques and the working of different peripherals.

Course Objectives:

1. To make students aware of the different components of an IoT System
2. To make students learn the architecture of ESP8266.
3. To make students learn the interfacing of different peripherals with microcontroller.
4. To make students learn different communication technologies and application protocols used in IoT.
5. To introduce to students different IoT-enabling technologies.

Course Outcomes:

At the end of this course, students will be able to

1. Comprehend different components of an IoT System.
2. Design a solution based on ESP8266 for a given problem.
3. Develop interfacing programs for different applications using third-party tools for ESP8266.
4. Categorize different communication technologies and application protocols used in IoT.
5. Signify different IoT-enabling technologies for a given application.

SECTION – I

Unit 1 - Introduction to Internet of Things **[7 Hrs]**

Introduction to IoT, different components of an IoT system: embedded systems, sensors, communication systems, cloud, applications of IoT in various domains.

Unit 2 – Embedded Systems for IoT **[7 Hrs]**

Introduction to embedded systems, different components of an embedded system, and basics of microcontroller-based embedded systems; basics of Linux-based embedded systems, various embedded platforms used in IoT, and understanding the various IDEs used for embedded development.

Unit 3: Communication technologies for IoT: **[8 Hrs]**

Basics of the communication technologies like Bluetooth Low Energy (BLE), Zigbee, Wi-Fi, and RFID, their architecture, characteristics, limitation, power consumption parameters, and applications.

SECTION – II

Unit 4: Internet connectivity principles and Application protocols for IoT: **[8 Hrs]**

Internet connectivity, Communication, an overview of Protocols: IPv4, IPv6, 6LoWPAN, Basics of application protocols like MQTT and CoAP, their features, framework, message formats, implementations, and applications.

Unit 5: Design and Development **[7 Hrs]**

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – ESP8266 – Board details, IDE programming

Unit 6 –IoT Enabling Technologies **[7 Hrs]**

Introduction to: Wireless Sensor Networks, Cloud Computing Big Data Analytics, Communication Protocols, Embedded Systems

Internal Continuous Assessment (ICA):

ICA consists of a minimum of 8 tutorials based on the above syllabus

Text Book:

1. Internet of Things by Raj Kamal, McGraw Hill Education; First edition
2. Internet Of Things: A Hands-On Approach, By Arshdeep Bahga, Vijay Madisetti, Orient Blackswan Private Limited First edition
3. Internet of Things for Architects by Perry Lea, Packt Publishing Limited
4. Analytics for the Internet of Things (IoT) by Andrew Minteer, Packt Publishing; 1st edition

Reference Book:

1. Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies by Dimitrios Serpanos, Marilyn Wolf, Springer; 1st ed. 2018 edition
2. MQTT Essentials - A Lightweight IoT Protocol by Gaston C. Hillar, Packt Publishing Limited

Additional Resources:

1. ESP8266 Technical Reference

Walchand Institute of Technology, Solapur

Honors in Internet of Things

T.Y.B.Tech. (Electronics & Telecommunication Engineering), Semester-V

21ETU5HI1T – IoT Cloud Platform

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Practical : 2 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks

This course presents a basic introduction to AWS IoT that provides the cloud services that connect IoT devices to other devices and AWS cloud services. AWS IoT provides device software that can help one integrate IoT devices into AWS IoT based solutions. This further discusses how devices can connect to AWS IoT and its services that AWS provides.

Course Prerequisite:

Students must have completed the Fundamentals of IoT course.

Course Objectives:

1. To make student aware of different components of AWS IoT Core System
2. To make students learn AWS device data and service endpoints.
3. To make students learn fleet indexing services and registry data.
4. To make students aware of security best practices in IoT.
5. To introduce various cloud metrics.

Course Outcomes:

At the end of this course students will be able to,

1. Comprehend different AWS IoT components.
2. Demonstrate the use of AWS IoT Endpoints.
3. Configure things with the AWS IoT registry
4. Implement security best practices for a given application
5. Assess cloud metrics for reliability, efficiency and performance of a given IoT application.

SECTION - I

Unit 1 – Introduction to AWS IoT **[7 Hrs]**

How your devices and apps access AWS IoT, What AWS IoT can do, IoT in Industry, IoT in Home automation, How AWS IoT works, The IoT universe, AWS IoT services overview, AWS IoT Core services, Learn more about AWS IoT, AWS IoT resources and guides, AWS IoT in social media, AWS services used by the AWS IoT Core rules engine, Communication protocols supported by AWS IoT Core, What's new in the AWS IoT console

Unit 2 - Getting started with AWS IoT Core **[7 Hrs]**

Set up your AWS account, AWS IoT Core interactive demo, IoT quick connect, Explore AWS IoT Core services in hands-on tutorial, MQTT messages with the AWS IoT MQTT client.

Unit 3 - Connecting to AWS IoT Core **[8 Hrs]**

.AWS IoT Core - control plane endpoints, device endpoints, IoT Core for LoRaWAN gateways and devices, Connecting to AWS IoT Core service endpoints, Connecting devices to AWS IoT, Connecting to AWS IoT FIPS endpoints

SECTION - II

Unit 4 - Managing devices with AWS IoT **[7 Hrs]**

How to manage things with the registry, Thing types, Static thing groups, Dynamic thing groups, Tagging your AWS IoT resources.

Unit 5 – Security **[8 Hrs]**

Security in AWS IoT, Authentication, Authorization, Data protection, Identity and access management, Logging and Monitoring, Compliance validation, Resilience, Using AWS IoT Core With VPC endpoints, Infrastructure security, Security monitoring, Security best practices.

Unit 6 - Monitoring AWS IoT **[7 Hrs]**

Configure AWS IoT logging, Monitor AWS IoT alarms and metrics using Amazon CloudWatch, Monitor AWS IoT using CloudWatch Logs, Log AWS IoT API calls using AWS CloudTrail.

Internal Continuous Assessment (ICA):

ICA should consist of a minimum of eight experiments based on the above syllabus.

Text Book:

1. Designing Cloud Data Platforms by Danil Zburivsky, Lynda Partner, Manning Publications, 2021

Reference Book:

1. AWS administration-- the definitive guide: learn to design, build, and manage your infrastructure on the most popular of all the cloud platforms-- Amazon Web Services by Wadio, Yohan, Packt Publishing; 1st edition
2. Integration of Cloud Computing with Internet of Things: Foundations, Analytics and Applications (Advances in Learning Analytics for Intelligent Cloud-IoT Systems), 2021 by Monika Mangla , Suneeta Satpathy , Bhagirathi Nayak , Sachi Nandan Mohanty, Wiley-Scrivener; 1st edition

Additional Resources:

AWS IoT Core Documentation
https://docs.aws.amazon.com/iot/latest/developerguide/iot-gs.html

Walchand Institute of Technology, Solapur

Honors in Internet of Things

T.Y.B.Tech. (Electronics & Telecommunication Engineering), Semester-VI

21ETU6HI1T – Industrial IoT

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Practical : 2 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks

This course is a practical guide that lets one discover the technologies and the use cases for the industrial IoT considering the implementation of industrial processes, specialized control devices, and protocols, it covers the process of identification and connection of different industrial data sources gathered from different sensors and the ability to be able to connect these sensors with cloud platforms such as AWS/GCP and open source IoT platforms.

Course Prerequisite:

Students must have completed the IoT Cloud Platforms course.

Course Objectives:

1. To make students aware of the difference between IoT and Industrial IoT (IIoT)
2. To introduce the architecture of Industrial IoT and key practices.
3. To explain different WAN communication technologies and protocols and associated security aspects.
4. To introduce students with different industrial cloud platforms of IoT and assist in building practical applications.

Course Outcomes:

At the end of this course students will be able to**,**

1. Comprehend different components and technical requirements of an IIoT System.
2. Design reference IIoT architecture-based solution for the development of IIoT application.
3. Select appropriate communication technology and/or protocol for a given application.
4. Analyze the security issues associated with the identity access component of an IIoT system.
5. Implement cloud industrial IoT solutions for a given application.

SECTION - I

Unit 1: Introduction to the Industrial IoT **[7 Hrs.]**

What is IIoT, Key IIoT Technologies Catalysts and Precursors of the IIoT, Innovation and the IIoT, Key Opportunities and Benefits, The Digital and Human Workforce, Technical requirements, IoT background, History and definition, IoT enabling factors, IoT use cases IoT key technologies, IoT and IIoT similarities and differences, IoT analytics and AI, **Industrial Internet Use-Cases** – Healthcare and Smart Office

Unit 2: IIoT Reference Architecture **[7 Hrs.]**

The IIC Industrial Internet Reference Architecture, Industrial Internet Architecture Framework (IIAF), Architectural Topology, The Three-Tier Topology, Connectivity, Key System Characteristics, Data Management. **Designing Industrial Internet Systems -** The Concept of the IIoT, The Proximity Network, WSN Edge Node, Legacy Industrial Protocols, Modern Communication Protocols, Wireless Communication Technologies, Proximity Network Communication Protocols, Gateways.

Unit 3: IIoT WAN Technologies and Protocols **[8 Hrs.]**

IIoT Device Low-Power WAN Optimized Technologies for M2M : SigFox, LoRaWAN, Low Power Wi-Fi, LTE Category-M, Weightless Securing the Industrial Internet - Security in Manufacturing: PLCs and DCS, Securing the OT, Network Level: Potential Security Issues, System Level: Potential Security Issues, Identity Access Management

SECTION - II

Unit 4: Cloud Industrial IoT Solution with AWS **[7 Hrs.]**

The AWS architecture, AWS IoT, Registering for AWS IoT core, Storing data (using S3), AWS analytics, Athena, Glue, QuickSight

Unit 5: Cloud Industrial IoT Solution with Google Cloud **[7 Hrs.]**

Google Cloud IoT Core, Google Cloud Bigtable, Google Cloud analytics

Unit 6: Practical Industrial IoT Solution using OpenStack **[8 Hrs.]**

Understanding the architecture, understanding the OpenStack ecosystem: core projects (identity, compute, storage, imaging, dashboard, networking), introduction to application development, deploying the application (only definitions of bare metal, virtual machines, and containers, orchestration and configuration management, monitoring and metering, elasticity, updating and patching)

Internal Continuous Assessment (ICA):
ICA shall consist of minimum eight assignments based on above syllabus

Text Books:

1. Industry 4.0: The Industrial Internet of Things by Alasdair Gilchrist,, Apress; 1st ed. edition
2. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0 by Veneri, Giacomo; Capasso, Antonio, Packt Publishing; 1st edition
3. Internet Of Things: A Hands-On Approach, By Arshdeep Bahga, Vijay Madisetti, Orient Blackswan Private Limited First edition
4. Open OpenStack Cloud Application Development by Scott Adkins, John Belamaric, Vincent Giersch, Denys Makogon, Jason E. Robinson, O'Reilly Publications

Reference Books:

1. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything by Francis daCosta, Apress Publications 1st Edition

Additional Resources:

- AWS IoT Core Documentation: https://docs.aws.amazon.com
- Quickstart | Cloud IoT Core Documentation | Google Cloud https://cloud.google.com
- OpenStack Docs: https://docs.openstack.org/install-guide/overview.html
- Azure IoT documentation | Microsoft Docs https://docs.microsoft.com
- Docker Community Edition: https://store.docker.com
- JDK 1.8: http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
- Git: https://git-scm.com/downloads
- Node.js 8+: https://nodejs.org
- Python 3.7: https://www.python.org/downloads/
- Anaconda 5.3: https://www.anaconda.com/download/

Walchand Institute of Technology, Solapur

Honors in Internet of Things

Final Year B.Tech. (Electronics & Telecommunication Engineering), Semester-VII

21ETU7HI1T – Architecting IoT Solutions

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Practical : 2 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks

This course introduces AWS well-architected tool and makes an AWS-based infrastructure more efficient to increase performance and reduce costs. This further discusses the use of Well-Architected Framework to improve architectures with AWS solutions. Gain hands-on experience using compute, networking, storage and database AWS services covering IaaS and PaaS.

Course Prerequisite:

Students must have completed the Industrial IoT course.

Course Objectives:

1. To introduce students to AWS Well-Architected Framework
2. To introduce students to the important parameters of AWS Well-Architected Framework to perform reliably, securely and efficiently.
3. To introduce students with various security aspects of the framework.
4. To introduce students to various workload architectures paradigms.
5. To make students aware of various performance metric to achieve tradeoff between compute and memory reliant operations.

Course Outcomes:

At the end of the course, students will be able to

1. Experiment various paradigms offered by AWS Well-Architected Framework
2. Demonstrate the use of AWS Well-Architected Framework to review cloud operations
3. Monitor the potential risk for a given architecture
4. Measure the cloud architectures for multiple workloads for a given application
5. Assess the performance metric for a given use case

SECTION - I

Unit 1 – Introduction to Framework **[4 Hrs.]**

Introduction, Definitions, On Architecture, General Design Principles

Unit 2 - The Five Pillars of the Framework **[10 Hrs.]**

Design Principles, Definition, Best Practices, Resources of: Operational Excellence, Security, Reliability, Performance Efficiency, Cost Optimization,

Unit 3 – Operations **[8 Hrs.]**

Operational Excellence, Organization, Prepare, Operate, Evolve

SECTION - II

Unit 4 – Security **[6 Hrs.]**

Identity and Access Management, Detection, Infrastructure Protection, Data Protection, Incident Response

Unit 5 - Reliability **[6 Hrs.]**

Foundations, Workload Architecture, Change Management, AWS Well-Architected Framework for Failure Management.

Unit 6 – Performance **[10 Hrs.]**

Performance Efficiency, Selection, Review, Monitoring, Trade Offs, Cost Optimization, Practice Cloud Financial Management, Expenditure and usage awareness, Cost-effective resources, Manage demand and supply resources, Optimize over time

Internal Continuous Assessment (ICA):

ICA shall consist of a minimum of eight experiments/assignments based on the above syllabus.

Text Book:

1. AWS for Solutions Architects: Design your cloud infrastructure by implementing DevOps, containers, and Amazon Web Services, 2021, by Alberto Artasanchez, Packs Publishers 1st edition

Reference Book:

1. AWS for System Administrators: Build, automate, and manage your infrastructure on the most popular cloud platform – AWS by Prashant Lakhera, Packt Publishing 1st edition

Additional Resources:

AWS Well-Architected Framework Documentation
https://docs.aws.amazon.com/wellarchitected/latest/framework/welcome.html

Walchand Institute of Technology, Solapur

Honors in Internet of Things

Final Year B.Tech. (Electronics & Telecommunication Engineering), Semester-VII

21ETU7HI2L - Mini Project

Teaching Scheme:
Practical : 4 hrs/week, 2 credit

Examination Scheme:
OE : 50 Marks
ICA : 50 Marks

This course is introduced to enable students to apply the knowledge and skills gained through IoT honors courses to solve definitive engineering problems that involve the concepts of sensor integration, data migration from the edge to the cloud, transforming data, CICD pipeline and securing the access and management roles on the cloud with effective and precise architectural and deployment skills to reach the desired goal.

Course Prerequisite:
Students must have completed all the IoT honors courses till semester VI.

Course Objectives:

1. To make students apply the cloud architecting tools to define an architecture for a problem.
2. To make students work in a team for planning and execution towards the solution of a given engineering problem.
3. To make students challenge themselves in identifying the stakeholders, end results, possible tools, timeline and life cycle policy for solving the defined problem.
4. To make them prepare a technical report based on the architecture, tools and the entire lifecycle of the defined problem and communicate it effectively to the stakeholders.

Course Outcomes:

At the end of this course, students will be able to -

1. Apply the cloud architecting skills to define a rigid problem statement.
2. Analyze a given engineering problem to plan and execute in a team to acquire the desired goals.
3. Develop a solution to the proposed problem empirical to the cloud standards and stakeholders.
4. Prepare a technical report based on the proposed solution to a chosen problem.

Guidelines for project implementation:

1) Project group should be not more than 3 students per group.
2) Projects must be based on Internet of Things.
3) Week 1 & 2: Formation of groups, searching of an application based on IoT.
4) Week 3 & 4: Finalization of Mini project & Distribution of work.
5) Week 5 & 6: Identifying appropriate tools and their availability for implementation.
6) Week 7 & 8: Architecting, development, testing and debugging
7) Week 9, 10 & 11: Development (in real world - optional) and Deployment of the project
8) Week 12: Demo, Group presentation & report submission

Internal Continuous Assessment (ICA):

1. The seminar shall consist of the Literature Survey, Market survey, Basic project work and applications of Mini project.
2. Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
3. A certified copy of seminar/ project report shall be required to be presented at the time of final submission empirical to the selected problem statement.

Resources:

1. AWS IoT Core Documentation
2. https://docs.aws.amazon.com/iot/latest/developerguide/iot-gs.html
3. AWS IoT Core Documentation: https://docs.aws.amazon.com
4. Quickstart | Cloud IoT Core Documentation | Google Cloud https://cloud.google.com
5. OpenStack Docs: https://docs.openstack.org/install-guide/overview.html
6. Azure IoT documentation | Microsoft Docs https://docs.microsoft.com
7. Docker Community Edition: https://store.docker.com
8. JDK 1.8: http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
9. Git: https://git-scm.com/downloads
10. Node.js 8+: https://nodejs.org
11. Python 3.7: https://www.python.org/downloads/
12. Anaconda 5.3: https://www.anaconda.com/download/
13. AWS Well-Architected Framework Documentation
14. https://docs.aws.amazon.com/wellarchitected/latest/framework/welcome.html