SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING

Curruculum and Syllabi for

B.Tech (Honours / Minor)
Electronics and communication Engineering
with Specialization in Internet of Things

Regulations 2023
(R-2023)

CURRICULUM

Bachelor of Technology (Honours/ Minor) in Electronics and Communication Engineering With specialization in “Internet of Things”

COURSE DETAILS											
Sl. No.	Sem	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
					L	T	P		CAM	ESM	Total
1	IV	U23IXB401	Sensors Transducers Technology	PC	2	0	2	4	50	50	100
2	V	U23IXT502	Embedded Hardware System Design##	PC	3	0	0	3	25	75	100
3	VI	U23IXT603	Industrial Internet of Things##	PC	3	0	0	3	25	75	100
4	VII	U23IXB704	IoT Networking and Communication	PC	2	0	2	4	50	50	100
5	VIII	U23IXT805	Privacy and Security in IoT##	PC	3	0	0	3	25	75	100
6	VIII	U23IXW806	Project / Model Making	PW	0	0	2	2	50	50	100
							Total	**19**	**225**	**375**	**600**
Equivalent NPTEL courses##											

The student shall be given the option to earn 3 credits through one equivalent 12-week NPTEL course instead of any one course listed for the Honours degree programme that should be completed before the commencement of the eighth semester. Students are required to select the equivalent NPTEL course from the provided list with the approval of the Head of the Department before registering.

The available courses are as follows:

S. No	Course Code	Courses offered by the Department	Equivalent Courses recommended from NPTEL by the Department*
1	U23IXT502	Embedded Hardware System Design	• Embedded Systems Design • Introduction to Embedded System Design • Embedded Sensing, Actuation and Interfacing Systems
2	U23IXT603	Industrial Internet of Things	• Introduction To Internet of Things • Design for Industry 4.0 and Industrial Internet of Things • Electronics and IoT Design Workshop
3	U23IXT805	Privacy and Security in IoT	• Optical Wireless Communications for Beyond 5G Networks and IoT

* Subject to change based on the courses offered by the NPTEL

Department	**Electronics and Communication Engineering**	Programme: **B.Tech. (Hons.)**						
Semester	**IV**	Course Category: **PC**			*End Semester Exam: **TE & LE**			
Course Code	**U23IXB401**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**SENSORS TRANSDUCERS TECHNOLOGY**	**2**	**0**	**2**	**4**	**50**	**50**	**100**

Prerequisite	Basics of Sensors and Transducers		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping
	CO1	Explain the working principles, types, and applications of resistive transducers for measurement in various engineering applications.	**K2**
	CO2	Analyze the principles, types, and applications of inductive and capacitive transducers for accurate measurement in engineering systems.	**K2**
	CO3	Understand the working principles, types, and advancements in other transducers and smart sensors for modern measurement applications.	**K2**
	CO4	Develop skills in simulating and testing strain gauges, load cells, potentiometers, variable resistances, and RTDs using any simulation model for practical measurement applications.	**K4**
	CO5	Perform simulation and testing of thermistors, thermocouples, LVDTs, and piezoelectric pressure transducers using any simulation model for practical measurement applications.	**K4**

UNIT-I	**Transducers**	**Periods:10**
Resistive Transducers: Resistance Potentiometer: Loading effect on Potentiometer. Resistance Strain gauges: Un bonded and Bonded type strain gauges. **Applications:** Temperature Measurement using RTD and Thermistor – Gas flow measurement using hot-wire Anemometer –measurement of moisture in solids and wood – level measurement using resistive tapes. Piezoelectric Transducers - Magneto strictive Transducers – Hall Effect Transducers – Photo electric Transducer.		**CO1**
UNIT-II	**Sensors**	**Periods:10**
Inductive Transducers: Simple inductance and Mutual inductance Transducers – Induction Potentiometers. Linear Variable Differential Transformers – Variable reluctance transducers – Eddy current transducers. **Applications:** Displacement measurement - Thickness Measurement – Position Measurement. **Capacitive Sensors:** Variable area type – Variable dielectric type – Variable distance type. Applications: Capacitive Thickness Transducers – Capacitive Moisture Transducers - Capacitive Level Transducer		**CO2**
UNIT-III	**Smart Sensors**	**Periods:10**
Smart Sensors: Introduction, Mechanical-Electronic Transitions in Sensing, Nature of Sensors, Integration of Micromachining and Microelectronics. Micromachining: Bulk Micromachining, Wafer Bonding, Surface Micromachining, Other Micromachining Techniques, Micro milling, Lasers in Micromachining		**CO3**
UNIT-IV	**Analysis and testing of various Transducers Using Simulation**	**Periods:15**
1. Testing of Strain gauge 2. Testing of load cell 3. Testing of Pressure measurement using piezoelectric transducers. 4. Testing of LVDT. 5. Testing of potentiometer. 6. Testing of Variable resistance		**CO4**
UNIT-V	**Analysis and testing of various Sensors Using Simulation**	**Periods:15**
1. Testing of Thermistor. 2. Testing of Thermocouple. 3. Testing of Ultrasonic sensor 4. Testing of temperature Sensor using Resistive temperature Detector (RTD). 5. Testing of moister sensor 6. Testing of Touch sensors		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Textbooks

1. S.Vijayachitra, Transducers engineering, 2nd Edition, Prentice Hall of India, 2016.
2. Patranabis, D., “Sensors and Transducers”, 2nd Edition, Prentice Hall India Pvt. Ltd, 2010.
3. S.Vijayachitra, Transducers engineering, 2nd Edition, Prentice Hall of India, 2016.
4. Randy Frank, Artech House Publications, “Understanding Smart Sensors”, Second Edition.

Reference Books

1. Jacob Fraden, "Handbook of modern sensors physics, designs and applications", 5th edition, Springer, 2015.
2. PavelRipka, "Modern sensors handbook", ISTE Ltd, 1st edition, 2007.
3. Renganathan S., “Transducer Engineering” -Allied Publishers Limited, 2003
4. Doebelin E.A., “Measurement Systems: Applications and Design”, 5th Edition, Tata McGraw Hill Publishing Company, New Delhi

Web References

1. https://lecturenotes.in/search/Resistive%20Transducers%3A
2. https://lecturenotes.in/search/inductive%20and%20%20Capacitive%20Sensors
3. https://lecturenotes.in/search/Transducers%20and%20Smart%20Sensors

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	1	1	-	-	-	-	1	-	-
2	2	1	1	2	-	1	1	1	-	-	-	-	1	-	-
3	2	1	1	2	-	1	1	1	-	-	-	-	1	-	-
4	2	3	3	3	3	1	1	1	-	-	-	-	1	-	-
5	2	3	3	3	3	1	1	1	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

<table>
<tr><td rowspan="2">Assessment</td><td colspan="10">Continuous Assessment Marks (CAM) – Maximum 50 Marks</td><td>##End Semester Examination (ESE) Marks (Theory)</td><td>Total Marks (CAM+ ESE)</td></tr>
<tr><td colspan="5">Continuous Assessment (Theory)</td><td colspan="5">Continuous Assessment (Practical)</td><td></td><td></td></tr>
<tr><td></td><td>CAT 1</td><td>CAT 2</td><td>Model##</td><td>Attendance##</td><td>Total</td><td>Conduction of Practical</td><td>Report</td><td>Viva</td><td>Total</td><td>End Semester Examination (ESE) Marks (Practical)</td><td></td><td></td></tr>
<tr><td>Portion for Test</td><td>1 ½ Units</td><td>1 ½ Units</td><td>All 3 Units</td><td rowspan="4"></td><td rowspan="5"></td><td colspan="4" rowspan="2"></td><td rowspan="2">Practical Exam</td><td>All 3 Units</td><td rowspan="5"></td></tr>
<tr><td rowspan="2">Assessment Methodology</td><td>MCQ Test</td><td>MCQ Test</td><td>Written Exam</td><td>Written Exam</td></tr>
<tr><td colspan="2">50 Questions for Analytical Course Questions for Theory Course</td><td></td><td colspan="4"></td><td></td><td></td></tr>
<tr><td>Duration of the Test</td><td>1 hour 30 Min</td><td>1 hour 30 Min</td><td>3 hours</td><td colspan="4"></td><td>3 hours</td><td>3 hours</td></tr>
<tr><td>Marks</td><td>50</td><td>50</td><td>75</td><td>5</td><td>15</td><td>10</td><td>5</td><td>30*</td><td>30</td><td>75 (To be weighted for 50 Marks)</td><td></td></tr>
<tr><td>Weightage of CAM</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>10</td><td colspan="3">*To be weighted for 10 Marks</td><td>10</td><td>30</td><td></td><td></td></tr>
<tr><td>CAM / ESE Marks</td><td colspan="10">CAM Marks =10+10+30=50</td><td>ESE Marks = 50</td><td>100</td></tr>
</table>

Department	**Electronics and Communication Engineering**	Programme: **B.Tech. (Hons.)**						
Semester	**V**	Course Category: **PC**			End Semester Exam: **TE**			
Course Code	**U23IXT502**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**EMBEDDED HARDWARE SYSTEM DESIGN**	**3**	**0**	**0**	**3**	**25**	**75**	**100**

(Common to ALL Branches)

Prerequisite	Microcontroller and its Applications		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping
	CO1	To Comprehend the applications, examples, characteristics, design challenges related to Embedded Systems	**K2**
	CO2	To Understand CPU processing and its principles; select a microprocessor/ microcontroller for a particular application.	**K2**
	CO3	To Illustrate the program optimization and performance analysis	**K3**
	CO4	To Enumerate the pros and cons of Networks of Embedded systems	**K3**
	CO5	To Design and implement algorithms for Embedded systems	**K4**

UNIT-I	**INTRODUCTION**	**Periods:09**
Embedded Systems – Design Metrics – Optimization Challenges in Embedded system Design - Embedded Processors – General Purpose Processor – Single Purpose Processor and Application Specific Instruction Set Processor		**CO1**
UNIT-II	**DEVICES AND COMMUNICATION BUSES**	**Periods:09**
Introduction to I/O Devices – Types - Synchronous, ISO-synchronous and Asynchronous Communications - Serial Communication – I2C, USB, CAN – Wireless Communication – IrDA – Bluetooth.		**CO2**
UNIT-III	**REAL TIME OPERATING SYSTEMS**	**Periods:09**
Real Time Systems – Issues in Real Time Computing – Structure of a real time system – Process – Task – Threads – Classification of Tasks – Task Periodicity – Periodic Tasks- Sporadic Tasks – Aperiodic Tasks		**CO3**
UNIT-IV	**CPU AND BUS BASED COMPUTER SYSTEMS**	**Periods:09**
Embedded System Design Process -Programming Input and Output, Supervisor Mode, Exceptions and Traps, Co-Processors, Memory System Mechanisms. CPU Performance, CPU Power Consumption, Design Example-Data Compressor		**CO4**
UNIT-V	**PROGRAM DESIGN AND ANALYSIS**	**Periods:09**
Components for Embedded Programs, Models of Programs, Assembly, Linking, and Loading, Basic Compilation Techniques, Program Optimization, Program-Level Performance Analysis		**CO5**

LecturePeriods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods:45**

Textbooks

1. Raj Kamal, Embedded systems Architecture, Programming and Design, 2017, 3rd edition, reprint, McGraw Hill Education, India
2. Wayne Wolf, Computers as components: Principles of Embedded Computing System Design, 2013, 3rd edition.

Reference Books

1. Steve Heath, Embedded Systems Design, 2013, 3rd edition, EDN Series, United States.
2. Jane W. S. Liu, Real time systems, 2013, reprint, Pearson Education, UK

Web References

1. https://www.course.org/in/articles/embedded-systems
2. https://en.wikipedia.org/wiki/embedded_system
3. https:// www.udacity.com/course/embedded-systems
4. https://www.techtarget.com/embedded -systems
5. https://www.youtube.com/embedded-systems

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	1	1	-	1	1	1	1	3	1
2	2	1	1	2	-	1	1	1	-	1	1	1	1	3	1
3	2	1	1	2	-	1	1	1	-	1	1	1	1	3	1
4	2	3	3	3	3	1	1	1	-	1	2	3	1	3	3
5	2	3	3	3	3	1	1	1	-	1	2	3	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

	Continuous Assessment Marks (CAM)					End Semester Examination##	Total Marks (CAM+ESE)
	CAT 1	CAT 2	Model##	Assignment#	Attendance##		
Portion for Test	2 Units	2 Units	All 5 Units			All 5 Units	
Assessment Methodology	MCQ Test	MCQ Test	Written Exam	Individual Task #		Written Exam	
	50 Questions for Analytical Course 75 Questions for Theory Course						
Duration of the Test	1 hour 30 Minutes	1 hour 30 Minutes	3 hours			3 hours	
Test Marks	50	50	75	20	5	75	
Weightage for CAM	5	5	5	5	5		
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	100

*Maximum duration of one week for the course / workshop

Department	**Electronics and Communication Engineering**	Programme: **B.Tech. (Hons.)**						
Semester	**VI**	Course Category: **PC**			End Semester Exam: **TE**			
Course Code	**U23IXT603**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INDUSTRIAL INTERNET OF THINGS**	**3**	**0**	**0**	3	**25**	**75**	**100**

Prerequisite	Internet of Things communication protocols		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping
	CO1	Comprehend to the modern technologies need for IOT	**K2**
	CO2	Interpret basic industrial processes and its reference architecture	**K2**
	CO3	Illustrate the security aspect of IIOT	**K3**
	CO4	Handle real time security issues in IIOT	**K2**
	CO5	Analyse the various industrial IOT applications	**K3**

UNIT-I	**INTRODUCTION AND ARCHITECTURE OF IOT**	**Periods:09**
Definition and characteristics of IoT, Physical Design of IoT, Logical design of IoT, IoT enabling Technologies-wireless sensor network, Cloud computing, Big Data Analytics, Communication protocols.		**CO1**
UNIT-II	**INDUSTRIAL INTERNET OF THINGS**	**Periods:09**
IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.		**CO2**
UNIT-III	**IIOT ANALYTICS AND SECURITY**	**Periods:09**
Big Data Analytics and Software Defined Networks, Machine Learning and Data Science, Julia Programming, Data Management with Hadoop, Cloud Computing in IIoT, Fog Computing in IIoT.		**CO3**
UNIT-IV	**INDUSTRIAL IOT APPLICATION**	**Periods:09**
Health care application in industries, Inventory management and quality control, Plant safety and security, manufacturing industry, automotive industry, mining industry.		**CO4**
UNIT-V	**SMART WORLD**	**Periods:09**
Smart Sensors and IIOT, Smart grid, Hybrid renewable energy systems, Electronics in Smart city, Integration of Sensors in Robots and Artificial Intelligence, 5G Technology, Human-Machine Interaction, Virtual Reality.		**CO5**

LecturePeriods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Textbooks

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Alasdair Gilchrist, “Industry 4.0: The Industrial Internet of Things” by, ISBN: 978-1-4842- 2046-7, APRESS, 2016.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.

Reference Books

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”,1st Edition, VPT, 2014
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
3. Giacomo Veneri; Antonio Capasso, “Hands-on Industrial Internet of Things: create a powerful Industrial IoT infrastructure using Industry 4.0”, Packt Publishing, 2018
4. “Industrial Internet of Things: Cyber manufacturing Systems” by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer), 2017
5. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT by Giacomo Veneri, Antonio Capasso, Packt, 2018

Web References

1. https://nptel.ac.in/courses/106/105/106105195/
2. https://global.hitachi-solutions.com/blog/industry-4-0-technologies
3. https://www.i-scoop.eu/industry-4-0/
4. https://ottomotors.com/blog/5-industry-4-0-technologies
5. https://www.machinemetrics.com/blog/industry-4-0-technologies

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	-	-	1	-	-	-	-	-	-	1	-	-
2	2	1	1	-	-	1	-	-	-	-	-	-	1	-	-
3	2	1	1	-	-	1	-	-	-	-	-	-	1	-	-
4	2	3	3	-	3	1	-	-	-	-	-	-	1	-	-
5	2	3	3	-	3	1	-	-	-	-	-	-	1	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

	Continuous Assessment Marks (CAM)					End Semester Examination##	Total Marks (CAM+ESE)
	CAT 1	CAT 2	Model##	Assignment#	Attendance##		
Portion for Test	2 Units	2 Units	All 5 Units			All 5 Units	
Assessment Methodology	MCQ Test	MCQ Test	Written Exam	Individual Task #		Written Exam	
	50 Questions for Analytical Course 75 Questions for Theory Course						
Duration of the Test	1 hour 30 Minutes	1 hour 30 Minutes	3 hours			3 hours	
Test Marks	50	50	75	20	5	75	
Weightage for CAM	5	5	5	5	5		
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	100

*Maximum duration of one week for the course / workshop

Department	**Electronics and Communication Engineering**	Programme: **B.Tech. (Hons.)**						
Semester	**VII**	Course Category: **PC**			End Semester Exam: **TE & LE**			
Course Code	**U23IXB704**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**IOT NETWORKING AND COMMUNICATION**	**2**	**0**	**2**	**4**	**50**	**50**	**100**

Prerequisite	Basics of Sensors and Transducers and Basic of Communications		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping
	CO1	Understand IoT data processing and device design considerations	**K2**
	CO2	Identify key IoT connectivity technologies and their applications	**K2**
	CO3	Analyze communication protocols for constrained IoT devices	**K2**
	CO4	Implement MATLAB simulations for IoT interoperability.	**K3**
	CO5	Analyze IoT device management using MATLAB	**K2**

UNIT-I	**IOT PROCESSING TOPOLOGIES AND TYPES**	**Periods:10**
Data Format, Structured data, Unstructured data, Importance of processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading, Offload location, Offload decision making, Offloading considerations		**CO1**
UNIT-II	**IOT CONNECTIVITY TECHNOLOGIES**	**Periods:10**
Overview of IoT Connectivity Technologies, IEEE 802.15.4, Zigbee, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth		**CO2**
UNIT-III	**IOT COMMUNICATION TECHNOLOGIES**	**Periods:10**
Constrained nodes, Constrained networks, Types of constrained devices, Low power and lossy networks, Infrastructure protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols		**CO3**
UNIT-IV	**MATLAB-BASED IOT INTEROPERABILITY**	**Periods:15**
Experiment 1: Data Format Conversion in IoT Systems Experiment 2: Simulation of IoT Connectivity Technologies Experiment 3: Edge Processing Implementation for IoT Data Experiment 4: Connectivity Range Validation for IoT Devices Experiment 5: IoT Device Data Security Implementation Experiment 6: IoT Device Energy Consumption Modeling		**CO4**
UNIT-V	**MATLAB-BASED IOT DEVICE MANAGEMENT**	**Periods:15**
Experiment 1: Battery Life Estimation for IoT Devices Experiment 2: Edge Data Aggregation in IoT Networks Experiment 3: IoT Data Annotation with Semantic Metadata Experiment 4: Simulation of Actuator Control in IoT Devices Experiment 5: IoT Device Localization Using Signal Strength Experiment 6: Firmware Update Management in IoT Devices		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 60**

Textbooks

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.

Reference Books

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, and Rob Barton, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things,” Cisco Press, 2017.
2. Rajkumar Buyya, Selim Nehar, and Sanjay Ranka, “Internet of Things: Principles and Paradigms,” Morgan Kaufmann, 2014.
3. Shancang Li and Daoqiang Zhang, “Fog Computing: Concepts, Frameworks, and Technologies,” Springer, 2018.
4. Ian S. MacDonald, “Architecting the Internet of Things: A Practical Guide to IoT Solutions,” Apress, 2016.
5. Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Home Appliances, and Even Your Toothbrush Can Change the World,” Que Publishing, 2015.

Web References

1. https://www.cisco.com/c/en/us/solutions/internet-of-things/overview.html
2. https://aka.ms/iot-beginners
3. https://www.ibm.com/internet-of-things
4. https://www.intel.com/content/www/us/en/internet-of-things/overview.html
5. https://zigbeealliance.org/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	2	3	1	-	-	1	-	1	-	3	2	1
2	3	2	2	3	3	1	-	-	1	-	1	-	2	3	2
3	2	3	2	3	3	1	-	-	1	-	1	-	3	3	2
4	3	2	3	2	2	1	-	-	1	-	1	-	3	2	2
5	3	2	3	2	3	1	-	-	1	-	1	-	2	3	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks										##End Semester Examination (ESE) Marks (Theory)	Total Marks (CAM+ ESE)
	Continuous Assessment (Theory)					Continuous Assessment (Practical)						
	CAT 1	CAT 2	Model##	Attendance##	Total	Conduction of Practical	Report	Viva	Total	End Semester Examination (ESE) Marks (Practical)		
Portion for Test	1 ½ Units	1 ½ Units	All 3 Units							Practical Exam	All 3 Units	
Assessment Methodology	MCQ Test	MCQ Test	Written Exam								Written Exam	
	50 Questions for Analytical Course Questions for Theory Course											
Duration of the Test	1 hour 30 Minutes	1 hour 30 Minutes	3 hours							3 hours	3 hours	
Marks	50	50	75	5		15	10	5	30*	30	75 *(To be weighted for* 50 Marks)	
Weightage of CAM	2.5	2.5	2.5	2.5	**10**	**To be weighted for 10 Marks*			**10**	**30**		
CAM / ESE Marks	***CAM Marks =10+10+30=50***										***ESE Marks = 50***	**100**

Department	**Electronics and Communication Engineering**	Programme: **B.Tech. (Hons.)**						
Semester	**VIII**	Course Category: **PC**			End Semester Exam: **TE**			
Course Code	**U23IXT805**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PRIVACY AND SECURITY IN IOT**	**3**	**0**	**0**	3	**25**	**75**	**100**

Prerequisite	Internet of Things communication protocols		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping
	CO1	Understand the fundamental security issues in Internet of things	**K2**
	CO2	Demonstrate different Frameworks and Hardware Architecture of IoT Device	**K2**
	CO3	Analyse different IoT Protocols and Layer Functioning	**K3**
	CO4	Protect and secure the network connecting IoT devices to back-end systems on the internet	**K2**
	CO5	Demonstrate different authentication mechanism such as digital certificates, biometrics, etc	**K3**

UNIT-I	**FUNDAMENTALS OF IoT ECOSYSTEM**	**Periods:09**
IoT security issues, how to design an IoT system, Hardware, software and network security related to IoT systems - Basics of cryptographic solutions to IoT systems.		**CO1**
UNIT-II	**OVERVIEW OF CLOUD COMPUTING AND ITS SERVICES**	**Periods:09**
Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS.		**CO2**
UNIT-III	**CHALLENGES IN CLOUD COMPUTING**	**Periods:09**
Benefits and challenges of cloud computing - Public vs. Private clouds, Role of virtualization in enabling the cloud.		**CO3**
UNIT-IV	**SECURITY CONCEPTS IN CONTEXT TO IoT DEVICES**	**Periods:09**
Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, Virtualization		**CO4**
UNIT-V	**IoT SECURITY THREATS AND COUNTERMEASURES**	**Periods:09**
System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking.		**CO5**

LecturePeriods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Textbooks

1. David Etter, “IoT Security: Practical guidebook “Create Space, 1st Edition, 2016.
2. Drew Van Duren, Brian Russell, “Practical Internet of Things Security”, Packt, 1st Edition, 2016.

Reference Books

1. Sean Smith, “The Internet of Risky Things”, O'Reilly Media, 1st Edition, 2017
2. Brian Russell, Drew Van Duren, “Practical Internet of Things Security: Design a security framework for an Internet connected ecosystem”, 2nd Edition, 2018.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	-	-	1	-	-	1	-	1	-	3	-	-
2	3	2	2	-	-	1	-	-	1	-	1	-	2	-	-
3	2	3	2	-	-	1	-	-	1	-	1	-	3	-	-
4	3	2	3	-	-	1	-	-	1	-	1	-	3	-	-
5	3	2	3	-	-	1	-	-	1	-	1	-	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

	Continuous Assessment Marks (CAM)					End Semester Examination##	Total Marks (CAM+ESE)
	CAT 1	CAT 2	Model##	Assignment#	Attendance##		
Portion for Test	2 Units	2 Units	All 5 Units			All 5 Units	
Assessment Methodology	MCQ Test	MCQ Test	Written Exam	Individual Task #		Written Exam	
	50 Questions for Analytical Course 75 Questions for Theory Course						
Duration of the Test	1 hour 30 Minutes	1 hour 30 Minutes	3 hours			3 hours	
Test Marks	50	50	75	20	5	75	
Weightage for CAM	5	5	5	5	5		
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	100

*Maximum duration of one week for the course / workshop

Department	**Electronics and Communication Engineering**	Programme: **B.Tech. (Hons.)**						
Semester	**VIII**	Course Category: **PC**			End Semester Exam: **PW**			
Course Code	**U23IXW806**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PROJECT / MODEL MAKING**	**0**	**0**	**0**	**2**	**50**	**50**	**100**

The individual student will carry out any project/ model making in the field of Internet of Things. The student must identify the area of their specialization of Internet of Things and the project will be implemented under the supervision of a faculty assigned by the Head of the Department.

Students are expected to choose real world or relevant problems and apply the engineering principles learned, to solve the problem through building prototypes or simulations or writing codes or establishing processes/synthesis/correlations etc.

The progress of the work will be monitored and assessed as per guidelines. A minimum 20 pages report must be prepared and submitted at the end of eighth semester after completion of the project work.

Assessment Guidelines
Student will be evaluated by the Internal and External Members based on the below criteria.

Criteria	Internal	External
Identification of Problem Domain	5	5
Study of Existing Systems and establishing clear objectives	10	10
Planning of project	10	10
Proper Documentation and Technical Writing	10	10
Presentation and Response to questions	15	15
Total Marks	**50**	**50**