KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

S.P.G. Chidambara Nadar - C. Nagammal Campus

S.P.G.C. Nagar, K. Vellakulam – 625 701 (Near VIRUDHUNAGAR)

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

Value Added Course

on

Internet of Things using LoRAWAN Technology

Date : 31.07.2023 to 05.08.2023 **Class : III ECE**

No. of Participants: 20

Academic Year: 2023-2024

(ODD Semester)

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1.	Academic Year	:	2023-2024
2.	Regulation	:	2021
3.	Department Name	:	Electronics and Communication Engineering
4.	Name of the Value Added Course	:	Internet of Things using LoRAWAN Technology
5.	No. of Credits	:	2
6.	Category: Theory/Lab/Hands-on/Skill based etc	:	Hands-on
7.	Name and Details of the Joint-organization (industry/NGO etc) if any	:	Enthu Technology Solutions India Pvt. Ltd, Coimbatore
8.	Resource person details	:	Dr.K.Subramanian Enthu Technology Solutions India Pvt, Ltd., Coimbatore
9.	Three Member Committee details	:	1. Dr. R. Suresh Babu, HoD/ECE 2. Dr. S.Nisha Rani, Course Incharge & Expert 3. Er. S. Alwyn Rajiv, Chairperson
10.	VAC Coordinator Details	:	Dr.S.Nisha Rani, AP/ECE
11.	Duration (30 h mandatory)	:	45 Hours
12.	Period	:	31.07.2023 to 05.08.2023 (6 Days)
13.	Venue	:	Research Lab- ECE Lab I (ECE Dept.)

Guidelines / Assessment of VAC:

1. Internal 40 Marks. Preferably Assignments such as mini projects, presentations, worksheets, etc.
2. External 60 Marks. MCQs type.
   MCQs Type question paper pattern : Part A – 30 x 1 = 30 Marks, Part B – 15 x 2 = 30 Marks
   Total (IM + EM): 100 Marks
   Passing Criteria: 50 Marks
   No revaluation and no re-exam will be entertained.
3. Mode of External Exam: Online proctored mode
4. Duration of the Exam: 1 h 30 min

VAC Coordinator

HoD

Dean (Academic Courses)

Encl:

1. Syllabus Copy
2. BoS Approval
3. Three Member Committee MoM
4. Geo-Tagged Photos
5. Certificates of all participants
6. Questionnaire
7. Attendance Sheet
8. Evaluated Answer script
9. Test Report
10. Feedback form
11. Feedback analysis
12. Students' oral feedback and Video (recorded video)

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06/06/2023

Minutes of 3 Member Committee Meeting

Member 1 - Head of the Department - Dr R. Suresh Babu

Member 2 – Course Incharge &Expert Member – Dr. S Nisha Ram

Member 3 - Chairperson – Mr. S. Alwyn Rajiv

The following points were discussed in the 3 Member Committee meeting held on 06th June 2023.

1. Discussed about the Syllabus given by Enthu Technology Solutions India Pvt. Ltd, Coimbatore on 7th June 2023
2. Decided to conduct online pre requirement session to III ECE Students on 28th July 2023
3. The dates of the course were decided in the meeting as 31/07/2023 & 05/08/2023 (6 days)
4. Discussed to conduct review of project after the completion of the course
5. Discussed about the venue of value added program

Course In-charge | Class Chairperson | HOD/ECE

Enthu Technology Solutions India Pvt Ltd
Plot No: 32, P.M.R Layout, 5th Street, Block - B,
Deepa Mill Road, Goldwins, Civil Aerodrome Post,
Coimbatore
India
GSTIN : 33AADCE9083H1ZJ

Proforma Invoice

Syllabus

ETS/22-23/PI/302

Proforma Invoice Date	04-06-2023	**Place of Supply**	Tamil Nadu
Valid Upto	19-06-2023		
Reference#	Your phone call dated on 03.06.2023		

Bill To

Kamaraj College of Engineering and Technology
S.P.G.Chidambara nadar, C.Nagammal Campus
S.P.G.C. Nagar,K.Vellakulam
Virudhunagar, Tamil Nadu - 625701,India
✆ (+91)4549 278171

Ship To

Kamaraj College of Engineering and Technology
S.P.G.Chidambara nadar, C.Nagammal Campus
S.P.G.C. Nagar,K.Vellakulam
Virudhunagar, Tamil Nadu - 625701,India
✆ (+91)4549 278171

S.NO	ITEM & DESCRIPTION	HSN/SAC	QUANTITY	UNIT PRICE	EXTENDED PRICE
1	Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology	999293	20	1,800.00	36,000.00 ₹
Totals			**20**	**1,800.00 ₹**	**36,000.00 ₹**

Items in Total : 20

Sub Total	**36,000.00 ₹**
CGST	**3,240.00 ₹**
SGST	**3,240.00 ₹**
Total	**42,480.00 ₹**

Total In Words : **Forty-Two Thousand, Four Hundred And Eighty Rupees only**

Program Title: Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology
The Program Proposed by: Dr.R.Sureshbabu & Dr.T.Prathipa
Eligible Branch: BE
Maximum Strength: 20
Hands-On Training Period: 6 days
Training Charges: Rs. 300 per student per day

Objective:
- To introduce the fundamental architecture of Microcontrollers
- To Learn the interface of peripheral devices (Sensors/Actuators)
- To explore the integration between Microcontroller and with LoRa-IoT platform
- Understand the concept of Wireless Communication Protocols for LoRa-IoT

Applications (Wi-Fi, Bluetooth, BLE)
- Understand the concept of MQTT, HTTP Protocols

Pre-requisite (Technical):
- Basic Knowledge of Microcontroller
- Basic Knowledge of C Programming

Topics to be covered in the Technology Training Period:
Day1
Session I
- Introduction to IoT
- IoT Applications
- IoT Architecture
- IoT Cloud platforms and utilizations
- Introduction to IoT-enabled devices
- Introduction to Embedded systems and microcontrollers
- Introduction to Arduino IDE
- Introduction to Arduino programming and library installation
- Introduction to ESP 32 microcontroller
- Basics introduction to sensor interfacing with ESP 32

Session II
- Sensor interfacing with WDM

For Enthu Technology Solutions India Pvt. Ltd.

Dr. K. Subramanian
Technical Lead
Enthu Technology Solutions India Private Limited
Coimbatore-04
Cell: 9944849058 | Email: subramanian@enthutech

Authorized Signature

- Hands-on demo with WDM IR sensor
- Hands-on demo with WDM SHT31 sensor
- Hands-on demo with WDM DHT11 sensor

Day 2
Session I
- Thingspeak Cloud
- Data monitoring in the cloud using WDM
- Device control using Cloud platform
- Device control using Mobile application (WDM)
- Data monitoring using mobile application

Session II
- Introduction to Bluetooth
- Introduction to BLE
- Device control and data accessing using Bluetooth
- Light, Fan control Using Bluetooth
- Bluetooth Application interfacing

Day3
Session I
- Introduction to LoRa Technology & LoRaWAN Technology
- Introduction to Radio Frequency
- Node to Node Communication with LoRa
- Install LMIC Library for LoRaWAN Communication
- Customize the library for Frequency & Boards
- Pin Mapping with Hardware using

Session II
- Configure LoRaWAN Gateway in Network Server
- Uplink from End Node to Network Server using OTAA •Mode/ABP Mode
- Decoding the Received Data
- Downlink Data from Network Page to End Device

Day4
Session I
- LM35 Sensor interfacing with LoRa
- DIY. IR Sensor interfacing with LoRa
- Uplink from End Node to Network Server using OTAA Mode
- Decoding the Received Data
- Downlink Data from Network Page to End Device

Session II
- Ultrasonic Sensor interfacing with LoRa
- Uplink from End Node to Network Server using OTAA Mode
- Decoding the Received Data
- Downlink Data from Network Page to End Device
- Application server Registration

Day 5
Session I
- Introduction to ThingZmate Cloud Applications
- Gateway Configuration
- Device integration
- Data Visualization in Application Server with Multiple widgets

Session II
- Hands-on demo: Ultrasonic sensor Data visualization in Application Server
- SMS, Email Alert using ThingZmate
- Review

Enthu Technology Solutions India Pvt Ltd
Plot No: 32, P.M.R Layout, 5th Street, Block - B,
Deepa Mill Road, Goldwins, Civil Aerodrome Post,
Coimbatore
India
GSTIN : 33AADCE9083H1ZJ

Day 6
- Project Support and Review

The outcome of the Course: The participants will be able to:
- Understand the importance of microcontrollers for LoRa-IoT
- Understand the concept of Wireless Communication Protocols
- Know the significance of LoRa IoT
- Design and Develop LoRa-IoT-based applications for societal issues.

Syllabus designer for the course
- Industry: ENTHU ACADEMIC SOLUTIONS, Academic division of Enthu Technology Solutions India Pvt. Ltd, #90, First Floor, SSN Square, Peelameduputhur, Coimbatore -641 004.

Hardware required: (Provided By Industry on a returnable basis to each batch)
- Wireless Development Board(WDM)

Sensor & Actuators Used for Practical Learning: (Provided By Industry on a returnable basis to each batch)
- LED - 3 qty
- Soil Moisture Sensor - 1 qty
- BH1750 Sensor - 1 qty
- IR sensor - 1 qty
- Ultrasonic Sensor - 3 qty
- PIR Sensor - 1 qty
- Flame Sensor - 1 qty
- DHT11 Sensor -3 qty
- LM35 Sensor - 3 qty

Software required: (Provided By Industry to each batch)
- Arduino IDE
- ESP32 dev library

Infrastructure Requirements from Institution for Hands-on :
- Individual PC / Laptops are mandatory
- Projector classroom & Board with Marker
- 230V, 5A Socket for Development Board-Power Supply
- Uninterrupted WiFi without Firewall(Most Mandatory)
- Multimeter and necessary extension boxes.
- Audio systems: Mic & Speaker

Benefits to the Participants:
- Exposure to Latest Technologies
- Participating in National and International Contests
- Exposure to Project Development
- Opportunity to become an Entrepreneur
- Placement Opportunities

Terms & Conditions
- Payment: Immediate Payment
- Mode of Training: Onsite/ Institute
- Duration of Training: 6 days, 5 hours per day
- Session of Training: 2 per day
- Batch Size: 20
- Training date: June 2023

Additional:
TA & DA applicable for Enthu Tech Resource Person (Actual)
1. Resource person's travel will be taken care of by Enthu Tech
2. Food & accommodation will be provided at the Institute Guest

VAC Coordinator

HOD/ECE

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Coimbatore
India
GSTIN : 33AADCE9083H1ZJ

[illegible] at the campus
• We will give our kits [illegible] from our team to the participants [illegible] for 15 batches, 2 participants for each batch.
• During Practical if Hardware Damage caused by students, it will be charged from students/institute should support for this.
• In case of any development and issues with your hardware our resource team won't take responsibility for developing and rectifying your hardware at that period of time.

Bank Account Details
Bank Name: [illegible] Bank
A/c Name: Enthu Technology Solutions India Pvt Ltd
Branch: Coimbatore - Ram Nagar
A/c No: [illegible]
IFSC Code: [illegible]

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Department of Electronics and Communication Engineering

Seventh BoS Meeting Minutes

Date : 30.09.2023

Time : 2.00 PM

Venue : VLSI Lab, ECE Department

Link (hybrid mode) : https://tinyurl.com/mu6nhaud

The following members were present:

S.No.	Name of the Expert	Designation	Capacity
1.	Dr.E.S.Gopi, Ph.D.,	Associate Professor/ECE National Institute of Technology, Tiruchirappalli, Tamil Nadu	Anna University Nominee (Online mode)
2.	Dr. M. Sabarimalai Manikandan Ph.D.,	Associate Professor, Department of Electrical Engineering, Indian Institute of Technology Palakkad	Academic Council Nominee 30/09/2023
3.	Dr. A Kannammal, Ph.D.,	Associate Professor/ ECE PSG College of Technology, Avinashi Rd, Peelamedu -641004, Coimbatore	Academic Council Nominee (Online mode)
4.	Mr.M.Chinnathambi, M.E.,	Technical Lead Viasat India, Global Infocity, Module 1&2, 5th Floor, Block C, No.40, MGR Salai, Perungudi- 600 097, Chennai.	Industrial Expert
5.	Ms.A.Anto Amala, M.E.,	Associate Staff Engineer, Samsung Semiconductor India Research, Laxmi Sagar Layout, Mahadevapura, Bengaluru, Karnataka 560048	Alumni

Internal Faculty Members of BoS			
S.No.	Name of the Faculty	Designation	Signature
1.	Dr.R Suresh Babu	Professor & Head	
2.	Dr.T.Pandiselvi	Associate Professor	
3.	Dr.N.M.Mary Sindhuja	Associate Professor	30/9/2023
4.	Dr.T.Prathiba	Assistant Professor	30/9/23
5.	Dr.S.Nisha Rani	Assistant Professor	30/09/2023
6.	Mrs.C.Nagavani	Assistant Professor	30/9/23
7.	Mr.P.Aravind	Assistant Professor	
8.	Mr.R.Ashok	Assistant Professor	
9.	Mrs.M.Stella Mercy	Assistant Professor	
10.	Mr.S.Alwyn Rajiv	Assistant Professor	
11.	Mrs.P.Muthumari	Assistant Professor	
12.	Mrs.P.Ramalakshmi	Assistant Professor	
13.	Mr.R.Rajprabu	Assistant Professor	

007.01.00 : Welcome address by HoD

- Dr.R.Suresh Babu, Professor & Head welcomed the BoS members.

007.02.00 : Approval of 6th BoS Meeting Minutes & Action taken

Item No.	Suggestions of BoS Members in 6th BoS Meeting	Action Taken
1.	Dr.E.S.Gopi, Ph.D., suggested to include prerequisites for each course in the Professional elective list.	Unit I is framed as basic for all the professional courses
2.	Dr.E.S.Gopi, Ph.D., insisted to have some of the courses as industry based and partially it can be handled by the experts from industry.	Semiconductor Test Engineering Course will be handled by the faculty members trained by Tessolve Semiconductor pvt ltd, Bangalore. Tessolve Semiconductor Industrial persons will also handle some topics. Value added courses are completely handled by the industrial persons.
3.	Dr.E.S.Gopi, Ph.D., also suggested to have Data Analytics as a common course for all the departments.	Data Analytics course is included in Institute level minor courses.
4.	Dr. M. Sabarimalai Manikandan Ph.D., insisted to give Open ended projects across the departments.	Many students are doing projects with other department students
5.	Dr.E.S.Gopi, Ph.D., and Dr. M. Sabarimalai Manikandan Ph.D., suggested to include Microprocessor as 1 unit in Embedded and modify the course name as Microprocessor and Embedded Systems	Included Microprocessor as 1 unit in Embedded and modified the course name as Microprocessor and Embedded Systems
6.	Dr.E.S.Gopi, Ph.D., insisted to combine control systems with Signals and Systems. Include the course Statistical Theory of Communication which may include Detection, Estimation and Information Coding. Dr.T.Prathiba suggested to bring the course Artificial Intelligence and Machine Learning in VI Semester. Move the course Statistical Theory of Communication in VII Semester.	Control system is combined with sensors and is included as Profeesional Elective. Included the course Statistical Theory of Communication which may include Detection, Estimation and Information Coding. Artificial Intelligence and Machine Learning is brought to VI Semester
7.	Dr.E.S.Gopi, Ph.D., and Dr. M. Sabarimalai Manikandan Ph.D., suggested to include Microprocessor experiments also and modify the course title for Embedded	Microprocessor experiments are included and modified the course title as Microprocessor and Embedded Systems laboratory

	Systems laboratory as Microprocessor and Embedded Systems laboratory	
8	Dr.E.S.Gopi, Ph.D., and Dr. M. Sabarimalai Manikandan Ph.D., suggested to rename the course VLSI Testing and Design for Testability as VLSI Architecture for Signal Processing and Machine Learning	VLSI Testing and Design for Testability course is renamed the course as VLSI Architecture for Signal Processing and Machine Learning
9.	Dr.E.S.Gopi, Ph.D., suggested to include the Acoustics also in Speech Processing course. Hence the course name is changed as Acoustics & Speech Processing	Included Acoustics and the course name is changed as Acoustics & Speech Processing
10.	Dr.E.S.Gopi, Ph.D., insisted to remove DSP Architecture and Programming course. Instead he suggested to include Pattern recognition and Computational Intelligence	Removed DSP Architecture and Programming course and included Pattern recognition and Computational Intelligence
11.	Dr. M. Sabarimalai Manikandan Ph.D., insisted to remove Multimedia Compression Techniques course. Instead he suggested to include Deep Learning	Removed the course Multimedia Compression Techniques. Included Deep Learning course
12.	Dr. M. Sabarimalai Manikandan Ph.D., suggested to include SONAR along with RADAR. So, the course name is changed to RADAR & SONAR Signal Processing	Included SONAR and the course name is changed to RADAR & SONAR Signal Processing
13.	Dr. M. Sabarimalai Manikandan Ph.D., insisted to remove Microprocessor and Microcontroller course. Instead he suggested to include Sensors and Control Systems.	Microprocessors are included in Microprocessor and Embedded Systems course. So, removed the course Microprocessor and Microcontroller. Included Sensors and Control Systems.
14.	Dr.E.S.Gopi, Ph.D., insisted to remove Bio-sensors and Instrumentation course. Instead he suggested to include MEMS & Nanoelectronics	Removed Bio-sensors and Instrumentation course. MEMS & Nanoelectronics course is included.
15.	Dr. M. Sabarimalai Manikandan Ph.D., suggested to remove the course RFID and include the topics of RFID and sensors in Internet of Things Course. Instead, basics of Wireless Technologies course may be included with various wireless technologies used for Sensor Technologies.	The course RFID is removed and included the topics of RFID and sensors in Internet of Things Course. Wireless Technologies Course is included.

16.	Dr. M. Sabarimalai Manikandan Ph.D., suggested to rename the course Communication Protocol and Network Security for IoT as Device and Data Security	Renamed the course Communication Protocol and Network Security for IoT as Device and Data Security
17.	Dr. M. Sabarimalai Manikandan Ph.D., suggested to rename the course Basic Electronics and its Applications as Analog Devices and Circuits.	The course Basic Electronics and its Applications is renamed as Analog Devices and Circuits.
18.	Dr.E.S.Gopi, Ph.D., and Dr. M. Sabarimalai Manikandan Ph.D., verified the syllabus of Machine Learning and Embedded Systems and insisted that machine learning and Embedded systems are two different courses and it is a dumped syllabus. Focus only on Machine Learning and the course name may be changed as Introduction to Machine Learning.	Machine Learning and Embedded Systems course is changed as Introduction to Machine Learning
19.	Dr. M. Sabarimalai Manikandan Ph.D., suggested to rename the course Electronic Product Design using PCB as Electronic System Design	The course Electronic Product Design using PCB is renamed as Electronic System Design
20.	Dr.E.S.Gopi, Ph.D., insisted the following regarding NPTEL • In R2020, Online course is a core course. If NPTEL is the online course, then in the transcript it may be printed as NPTEL course or the NPTEL course name (Which is chosen by the student). • If a student fails in NPTEL, it should not be considered as arrear if he compensates with subjects handled by the department. • Mentor role is very important in NPTEL course.	Dr.E.S.Gopi, Ph.D., was discussed in Academic Council meeting. It is decided that the NPTEL course name will be printed on the manuscript. If a student could not pass until the seventh semester, he has to write the theory course in VIII semester. The name of the theory course will be mentioned in the transcript.

BoS members approved the action taken in 6th BoS Meeting Minutes

007.03.00 : Discussion and approval of

007.03.01 : Proposed Curriculum and Syllabi for VII and VIII Semester

VII Semester

Name of the Course	Suggestions from BoS members
Universal Human Values and Ethics	Approved the course and syllabus
Statistical Theory of Communication	Approved the course and syllabus

VIII Semester

Name of the Course	Suggestions from BoS members
Project Work	Approved the course

007.03.02 : List of Open Elective 1,2,3 & 4 courses offered

Name of the Course	Offered to	Suggestions from BoS members
Fundamentals of Electronic Devices and Circuits	CSE, IT, ADS, EEE, Mechanical, Civil, Mechatronics and Bio-Technology	1. Dr.M.Sabarimalai Manikandan Ph.D., suggested that instead of wave shaping circuits, include linear Integrated circuits using op-amp with the topics of Integrator, Differentiator, differential amplifier and Instrumentation amplifier. 2. Also he insisted to frame the new course as combine as follows. Unit I with Unit III contains special diodes. Add Basics of Digital Electronics as Unit V can be included with the topics of combinational and sequential circuits. For the digital electronics unit the text book "Digital Fundamentals" authored by, Thomas L. Floyd may be included
Telecommunication Network Management	CSE, IT, ADS, EEE, Mechanical, Civil, Mechatronics and Bio-Technology	1. Dr.M.Sabarimalai Manikandan Ph.D., suggested that Telecommunication Network Management course may be replaced with "Sensors and Wireless Technologies" course because Telecommunication Network Management course is the outdated one. 2. They also insisted to frame the new course as, Unit I & Unit II can be framed with Sensors topics, Unit III - Basic Modulation scheme, Unit IV- Wireless Radios and standards including the topics of Wifi, Bluetooth, Zigbee, LoRa, RFID, LTE, Wimax,5G and Unit V with Wireless Network Topologies - Ring, Star, Mesh, Bus and ISO model.

VLSI Design	CSE, IT, ADS, EEE, Mechanical, Civil, Mechatronics and Bio-Technology	1 Dr.M.Sabarimalai Manikandan Ph.D., and Dr.E.S.Gopi, Ph.D., suggested that VLSI Design course is tough for other department students. So, they insisted to change the course as MEMS & VLSI 2 They also insisted to frame the new course as follows. Digital Logic as Unit I covered with topics of Basic logic families. CMOS VLSI as Unit II, Unit III and Unit IV may be covered with MEMS concepts. Verilog programming as Unit V with programming of Analog & Digital Design. More weightage may be given for programming.
Industrial IoT and Industry 4.0	CSE, IT, ADS, EEE, Mechanical, Civil, Mechatronics and Bio-Technology	Dr.M.Sabarimalai Manikandan Ph.D., suggested to change the Industrial IoT and Industry 4.0 course title into Industry 4.0. Unit I title is changed as Introduction to Industry 4.0. Unit II may be based on IoT Components. Unit III Security Systems is about autonomous vehicles. Unit IV may be Data Analytics and Imaging Systems
Medical Electronics	CSE, IT, ADS, EEE, Mechanical, Civil, Mechatronics and Bio-Technology	Dr.M.Sabarimalai Manikandan Ph.D., insisted to combine Unit I and Unit II. He also insisted that in Unit II, include topics under Medical Imaging Modalities such as X-ray, CT Scan, PET, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems. Rangaraj M Rangayyan, 'Biomedical Signal Analysis-a case-study approach' may be included as one of the reference books

- Dr. E. S. Gopi, Ph.D., insisted that for all the open elective courses must be self-explanatory.
- Dr. E. S. Gopi, Ph.D., and Dr. M. Sabarimalai Manikandan Ph.D., insisted to add Introduction to Signal Processing as one of the open elective courses.

007.03.03 : List of courses for PhD candidates

Name of the Course	Suggestions from BoS members
Advanced Design of Experiments	Approved the course and syllabus
Big Data	Approved the course and syllabus
Deep Learning	Approved the course and syllabus
Machine Learning	Approved the course and syllabus
Internet of Things	Approved the course and syllabus

- Dr. E. S. Gopi, Ph.D., and Dr. M. Saktimalai Manikandan, Ph.D., suggested to include Linear Algebra, Probability and Statistics, Numerical Methods and Computing and more courses for PhD course works

007.03.04 : Human Values and Ethics Courses

Name of the Course	Suggestions from BoS members
Universal Human Values and Ethics	Approved the course and syllabus

007.04.00 : ITEMS FOR RATIFICATION

007.04.01 : Changes or Corrections in the existing Curriculum of R2020 and R2021

Existing	Corrections required and specify the reasons
Mini Project, R2021	To move from VII semester to VI semester because it will be helpful for students placement in VII semester.
Statistical Theory of Communication, R2021	To move from VII semester to VI semester
EC2352 Microprocessor and Embedded Systems, R2021	To move from VI semester to VII semester
EC2353 Microprocessor and Embedded Systems laboratory, R2021	To move from VI semester to VII semester

007.04.02 : NPTEL Examination results (students performance) and action taken for the students who did not receive the certificates

- Students have to complete two 3 credits NPTEL courses mandatorily for R2020 curriculum.
- In IV ECE (2021-2024 Batch) under R2020, total number of students in the class is 61. In that, 3 students have cleared 3 courses, 48 students have completed 2 courses, 6 students have completed 1 course and 4 students didn't complete any of the NPTEL courses.

NPTEL Online Exam (January to April 2022)

Sl.No	Course Id	Course Title	Offered Institute	No. of Students Registered	No. of Students attended	No. of Students passed	No. of Students failed	Pass %
1	noc22-ee45	Digital System Design	IIT Ropar	61	61	24	37	39.34

NPTEL Online Exam (July to October 2022)

Sl.No	Course Id	Course Title	Offered Institute	No. of Students Registered	No. of Students attended	No. of Students passed	No. of Students failed	Pass %
1	noc22-hs76	Soft Skills	IIT, Roorkee	58	58	48	10	82.75
2	noc22-cs96	Introduction to Internet of Things	IIT, Kharagpur	10	10	10	--	100

NPTEL Online Exam (January to April 2023)

Sl.No	Course Id	Course Title	Offered Institute	No. of Students Registered	No. of Students attended	No. of Students passed	No. of Students failed	Pass %
1	noc23-mg33	Principles of Management	IIT, Roorkee	23	23	9	14	39.1
2	noc22-cs96	Introduction to Internet of Things	IIT, Kharagpur	25	25	20	5	80

Action Plan

- 6 students (1 course completed) + 4 (No Courses Completed) who failed in the registered subjects have to compensate with the subjects Softskills / IoT for this semester in NPTEL.
- Mentors are asked to monitor the assignment submissions of students.

007.04.03 : Curriculum feedback and action taken if any

- Collected the curriculum feedback from the students and action plan is being carried out.
- Dr. E. S. Gopi, Ph.D., insisted not to collect curriculum feedback from students, instead other stake holders feedback must be collected.

007.04.04 : Value Added Courses offered – ratification

The following are the value added courses conducted for the III year students in the academic year 2023-2024

S. No.	Course Name	Resource Person	Participants	Date
1.	Value Added Course on Deep Learning	Mr.R Ramachandran, Pantech eLearning Pvt Ltd.,	III ECE – 20 students	31st July 2023 to 05th August 2023
2.	Value Added Course on IoT Application Design using Raspberry Pi and Python	Mr.R Jegadeswaran, Enthu Technology Solutions India Pvt Ltd.	III ECE – 20 students	31st July 2023 to 05th August 2023
3.	Value Added Course on The Internet of Things using LoRaWAN Technology	Dr. Subramaniam Enthu Technology Solutions India Pvt Ltd.	III ECE – 20 students	31st July 2023 to 05th August 2023

BoS members approved the Value added courses conducted.

007.05.00: Information about the (Points Discussed in the following)

Item No.	Description	Suggestions / Comments from the BoS Members
007.05.01	Number of students doing Honours/ Honours with Specialization Minors and its respective courses	The HOD Presented the number of students doing Honours Honours with specialization Minors and its respective courses …. 1. Honors with Specialization degree-Semiconductor Chip Design and Testing-10 2. Honors with Specialization degree-Sensor Technologies and IoT-2 3. Honors degree – 9 4. Minor degree- Computing Technology-13
007.05.02	Student Internship Completion details	The HOD shared the statistical data of the student internship Inplant training details for R2020 & R2021 - All the 61 students of IV ECE (R2020) have completed - All the 60 Students of III ECE (R2021) have completed.
007.05.03	Pass Percentage of students	The HOD Presented the Pass percentage yearwise and course wise for the academic year 2022-2023 (Even). II Year- Pass percentage -76.67% III Year- Pass percentage – 88.53% IV Year- Pass percentage – 100%

007.05.04	Value Added Courses offered/ Planned for the academic year : 2023 – 2024	The HOD Presented the Value added course planned for II year students for the academic year 2023-2024 1. Integrated Full stack web development with IoT Networks 2. IoT Applications using Node MCU and Raspberry Pi 3. Machine Learning using Python
007.05.05	NBA eSAR / status /compliance preparation and its information	The HOD happily shared the NBA eSAR / Status On 09.01.2023 – NBA Compliance audit was held. Received NBA reaccreditation extended for three years (July 2023- July 2026)
007.05.06	Department achievements between 6th and 7th BoS	HoD happily shared the department, student and faculty achievements with the BoS members.

007.06.00 : Any other Item

- Next BoS Meeting is tentatively scheduled on March 2024.

007.07.00 : Vote of Thanks

- The meeting ended with the Vote of Thanks by Dr.S.Nisha Rani, Assistant Professor, Department of Electronics and Communication Engineering, Kamaraj College of Engineering and Technology, Virudhunagar.

6/10/2023

BoS Coordinator

Dr.S.Nisha Rani, AP/ECE

6/10/23

BoS Chairman

Dr.R.Suresh Babu

HoD / ECE

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COLLEGE OF ENGINEERING & TECHNOLOGY
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K.P.R. Chidambaram Nagar, K. Rasipuram Campus
K.P.R.C. Nagar, K. Vellakoil – 638 701 (Near) VIRUDHUNAGAR)

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

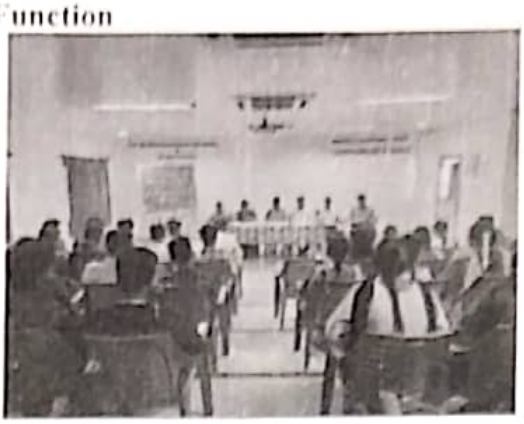
Value Added Course on

Internet of Things using LoRAWAN Technology

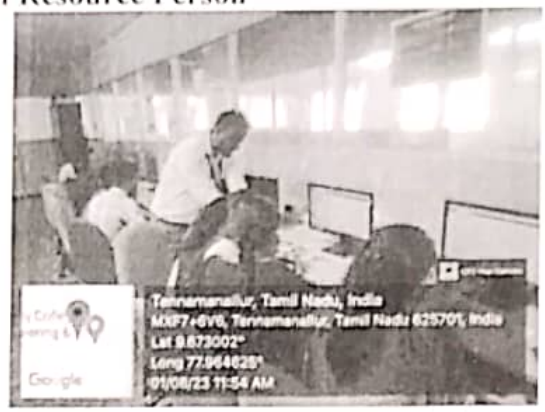
Date: 31.07.2023 to 05.08.2023 **Class: III ECE**

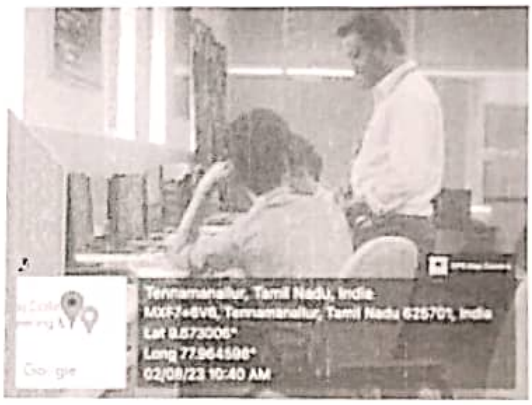
Geo Tagged Photos

Inaugural Function

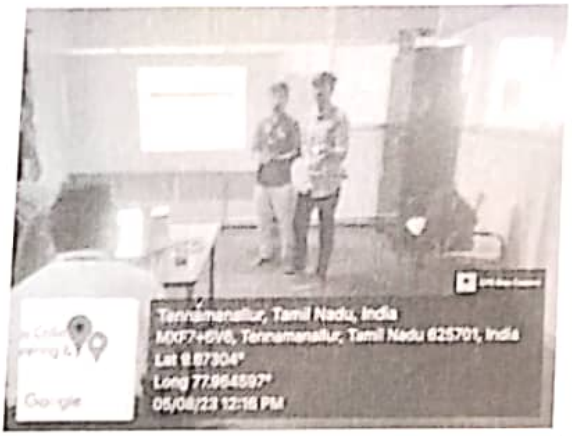


Session Photos with Resource Person



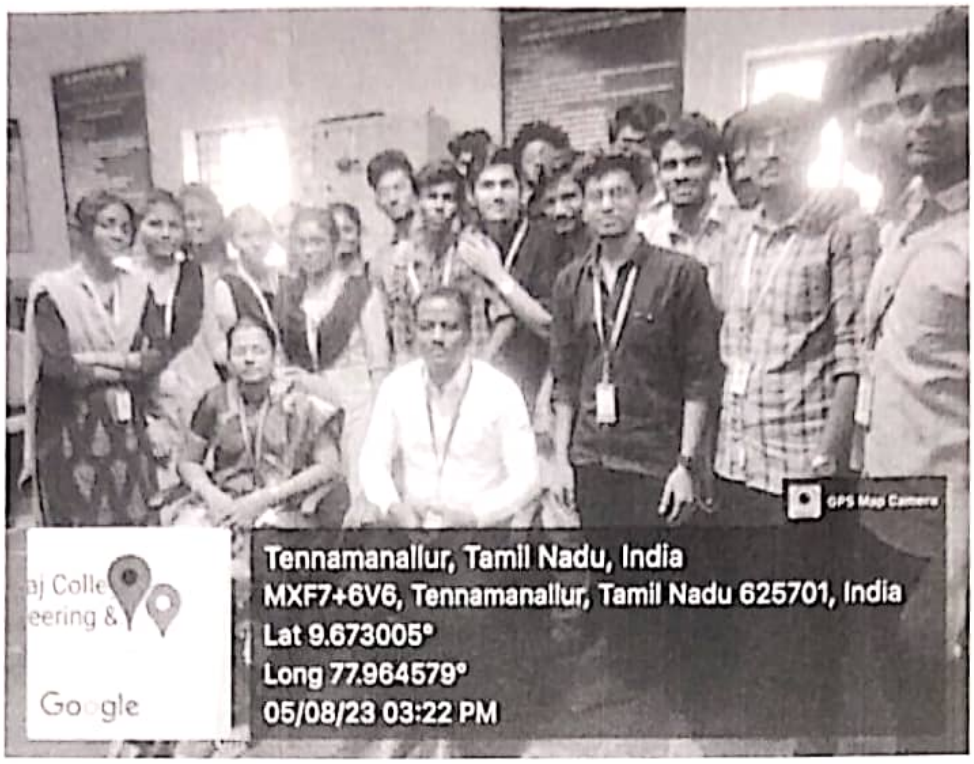


Project Presentation (Resource Person and Course Incharge)



Valedictory Function and Feedback Session Oral

Group Photo



VAC Coordinator

HoD/ECE

Mark Statement

Value Added Course on Internet of Things using LoRAWAN Technology (11.07.2023 to 05.07.2023)

Department of Electronics and Communication Engineering

Sl.No	Roll Number	Register Number	Name of the Student	Internal Mark (40 mark)	External Mark (60 mark)	Total Mark (100 mark)
1	21UEC003	920421106010	DHARSHINI S	35	27	62
2	21UEC005	920421106008	DHARANIDHARAN R	32	22	54
3	21UEC006	920421106029	PARTHASARATHY P	36	24	60
4	21UEC010	920421106024	NACHIYAR S	38	28	66
5	21UEC011	920421106005	BALAJI A	34	25	59
6	21UEC014	920421106003	ALAGUSANKARANARAYANAN R	36	37	73
7	21UEC016	920421106020	KIRUTHIYA VAISHNAVI S	40	27	67
8	21UEC021	920421106038	SARAN V	31	26	57
9	21UEC025	920421106006	BOOBALAN S	40	41	81
10	21UEC027	920421106022	MUHAMED SABEER ALI S	36	16	52
11	21UEC031	920421106018	KEERTHANA M	33	37	70
12	21UEC033	920421106042	SHEEBA ELIZABETH R	37	25	62
13	21UEC036	920421106037	RITHISH ARUNVARNA M	37	40	77
14	21UEC043	920421106055	YUWASRI T	32	30	62
15	21UEC047	920421106034	RAMJI B.G	38	34	72
16	21UEC049	920421106048	SUREKA K	32	42	74
17	21UEC057	920421106305	VETRIVEL B	39	39	78
18	21UEC058	920421106301	BHARATH VAJ R	39	41	80
19	21UEC060	920421106302	MUTHU RAAJ K	36	19	55
20	21UEC061	920421106303	SATHISKUMAR S	36	14	50

T. Ravi

VAC Coordinator

HoD

Dean (Academic Courses)

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S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR)

Department Electronics and Communication Engineering

Value Added Course on Internet of things using LoRaWAN Technology
Event Date: 31.07.2023 to 05.08.2023

Mark Statement

Department: ECE
Year: III
Regulation: 2021
Semester: V

Sl. No	Roll No.	Reg. No.	Student Name	Internal Marks (40)	External Marks (60)	Total (100)
1.	21UEC003	920421106010	DHARSHINI.S	35	27	62
2.	21UEC005	920421106008	DHARANIDHARAN.R	32	22	54
3.	21UEC006	920421106029	PARTHASARATHY.P	36	24	60
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20.	21UEC061	920421106303	SATHISKUMAR.S	36	14	50

Sighature with Seal
(Dr.K.Subramanian)

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This is to certify that Mr/ Ms DHARSHINI.S

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 62

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

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This is to certify that Mr/ Ms Dharanidharan.R

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 54

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

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This is to certify that Mr/ Ms *ParthaSarthy. P*

Department of *Electronics and Communication Engineering* successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 60

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Head - Enthu Academic Solutions

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Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 66

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This is to certify that Mr/ Ms Balaji. A

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Exam Score : 59

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

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This is to certify that Mr/ Ms Alagu Sankara Narayanan.R

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Exam Score : 73

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Mr. Moorthi Kanagaraj
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This is to certify that Mr/ Ms Kiruthiya Vaishnavi. S

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Exam Score : 67

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This is to certify that Mr/ Ms Saran.V

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Exam Score : 57

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Exam Score : 81

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This is to certify that Mr/ Ms Muhamed Sabeer Ali.S

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Exam Score : 52

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This is to certify that Mr/ Ms Keerthana.N

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Exam Score : 70

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This is to certify that Mr/ Ms Sheeba Elizabeth.R

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Exam Score : 62

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This is to certify that Mr/ Ms Rithish Aruo Varuna M

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 77

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This is to certify that Mr/ Ms Yuvasri.T

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during 31.07.2023 to 05.08.2023 handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 62

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

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This is to certify that Mr/ Ms Ramji. B.G

Department of Electronics and communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 72

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
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This is to certify that Mr/ Ms Sureka. K

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 74

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

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This is to certify that Mr/ Ms Vetrivel.B

Department of Electronics and Communicatioo Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 18

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
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This is to certify that Mr/ Ms Bharathvaj.R

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 80

V. Prakash

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

KM

Mr. Moorthi Kanagaraj
Founder & Director

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This is to certify that Mr/ Ms Muthu Raaj. K

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 55

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

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CERTIFICATE OF TRAINING

This is to certify that Mr/ Ms Sathis Kumar S

Department of Electronics and Communication Engineering successfully undergone 6 days of **Value Added Course on Internet of Things using LoRaWAN® Technology** during **31.07.2023** to **05.08.2023** handled by **Enthu Technology Solutions India Pvt Ltd**, Coimbatore at Karmaraj College of Engineering and Technology (An Autonomous Insitution), K.Vellakulam, (Near Virudhunagar)

Exam Score : 50

Mr. Prakash V. Anandan
Head - Enthu Academic Solutions

Mr. Moorthi Kanagaraj
Founder & Director

KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY
An Autonomous Institution

Department of Electronics and Communication Engineering

Value Added Course on Internet of Things using LoRaWAN Technology

31/07/2023 to 05/08/2023 (6 Days)

ATTENDANCE

S. No.	Roll Number	Name of the Student	31/07 (FN)	31/07 (AN)	01/08 (FN)	01/08 (AN)	02/08 (FN)	02/08 (AN)	03/08 (FN)	03/08 (AN)	04/08 (FN)	04/08 (AN)	05/08 (FN)	05/08 (AN)
1	21UEC003	DHARSHINI.S												
2	21UEC005	DHARANIDHARAN.R												
3	21UEC006	PARTHASARATHY.P												
4	21UEC010	NACHIYAR.S												
5	21UEC011	BALAJI.A												
6	21UEC014	ALAGU SANKARA NARAYANAN.R												
7	21UEC016	KIRUTHIYAVAISHNAVI.S												
8	21UEC021	SARAN.V												
9	21UEC025	BOOBALAN.S												
10	21UEC027	MUHAMED SABEER ALI.S												
11	21UEC031	KEERTHANA.M												
12	21UEC033	SHEEBA ELIZABETH.R												
13	21UEC036	RITHISH ARUN VARUNA.M												
14	21UEC043	YUWASRI.T												
15	21UEC047	RAMJI.B.G												

S. No.	Roll Number	Name of the Student	31/07 (FN)	31/07 (AN)	01/08 (FN)	01/08 (AN)	02/08 (FN)	02/08 (AN)	03/08 (FN)	03/08 (AN)	04/08 (FN)	04/08 (AN)	05/08 (FN)	05/08 (AN)
16	21UEC049	SUREKA.K												
17	21UEC057	VETRIVEL.B												
18	21UEC058	BHARATH VAJ.R												
19	21UEC060	MUTHU RAAJ.K												
20	21UEC061	SATHIS KUMAR S												

Coordinator

HoD/ECE

KAMARAJ
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(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
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S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR)

Department Electronics and Communication Engineering

Value Added Course on Internet of things using LoRaWAN Technology

Event Date: 31.07.2023 to 05.08.2023

Mark Statement

Department: ECE **Regulation: 2021**

Year: III **Semester: V**

Sl. No	Roll No.	Reg. No.	Student Name	Internal Marks (40)	External Marks (60)	Total (100)
1.	21UEC003	920421106010	DHARSHINI.S	35	27	62
2.	21UEC005	920421106008	DHARANIDHARAN.R	32	22	54
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20.	21UEC061	920421106303	SATHISKUMAR.S	36	14	50

Signature with Seal

(Dr.K.Subramanian)

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(An Autonomous Institution AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
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S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR)

Department Electronics and Communication Engineering

Value Added Course on Internet of things using LoRaWAN Technology
Event Date: 31.07.2023 to 05.08.2023

Mark Statement

Department: ECE
Year: III
Regulation: 2021
Semester: V

Sl. No	Roll No.	Reg. No.	Student Name	Internal Marks (40)	External Marks (60)	Total (100)
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2.	21UEC005	920421106008	DHARANIDHARAN.R	32	22	54
3.	21UEC006	920421106029	PARTHASARATHY.P	36	24	60
4.	21UEC010	920421106024	NACHIYAR.S	38	28	66
5.	21UEC011	920421106005	BALAJI.A	34	25	59
6.	21UEC014	920421106003	ALAGUSANKARANA RAYANAN.R	36	37	73
7.	21UEC016	920421106020	KIRUTHIYA VAISHNAVI.S	40	27	67
8.	21UEC021	920421106038	SARAN.V	31	26	57
9.	21UEC025	920421106006	BOOBALAN.S	40	41	81
10.	21UEC027	920421106022	MUHAMED SABEER ALI.S	36	16	52
11.	21UEC031	920421106018	KEERTHANA.M	33	37	70
12.	21UEC033	920421106042	SHEEBA ELIZABETH.R	37	25	62
13.	21UEC036	920421106037	RITHISH ARUNVARNA.M	37	40	77
14.	21UEC043	920421106055	YUWASRI.T	32	30	62
15.	21UEC047	920421106034	RAMJI.B.G	38	34	72
16.	21UEC049	920421106048	SUREKA.K	32	42	74
17.	21UEC057	920421106305	VETRIVEL.B	39	39	78
18.	21UEC058	920421106301	BHARATH VAJ.R	39	41	80
19.	21UEC060	920421106302	MUTHU RAAJ.K	36	19	55
20.	21UEC061	920421106303	SATHISKUMAR.S	36	14	50

Signature with Seal
(Dr. K. [illegible])

KAMARAJ

Department of Electronics and Communication Engineering

Value Added Course on Internet of Things using LoRaWAN Technology

31.07.2023 to 05.08.2023 (6 Days)

ATTENDANCE

S. No.	Roll Number	Name of the Student	31.07 (FN)	31.07 (AN)	01.08 (FN)	01.08 (AN)	02.08 (FN)	02.08 (AN)	03.08 (FN)	03.08 (AN)	04.08 (FN)	04.08 (AN)	05.08 (FN)	05.08 (AN)
1	21UEC003	DHARSHINI S												
2	21UEC005	DHARANIDHARAN R												
3	21UEC006	PARTHASARATHY.P												
4	21UEC010	NACHIYARS												
5	21UEC011	BALAJI S												
6	21UEC014	VEAGU SANKARA NARAYANAN R												
7	21UEC016	KIRUTHIYAVAISHNAVI S												
8	21UEC021	SARAN V												
9	21UEC025	BOOBALAN.S												
10	21UEC027	MUHAMED SABEER ALI A												
11	21UEC031	KEERTHANA.M												
12	21UEC033	SHEEBA ELIZABETHER												
13	21UEC036	RITHISHARUN VARUNA.M												
14	21UEC043	YUWASREE T												
15	21UEC047	RAMJI.B.G												

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S. No	Roll Number	Name of the Student	31/07 (FN)	31/07 (AN)	01/08 (FN)	01/08 (AN)	02/08 (FN)	02/08 (AN)	03/08 (FN)	03/08 (AN)	04/08 (FN)	04/08 (AN)	05/08 (FN)	05/08 (AN)
16	211EC049	SUREKAA K												
17	211EC057	VETRIVEL B												
18	211EC058	BHARATHSAI P												
19	211EC060	MUTHURAAJ K												
20	211EC061	SATHISKUMAR S												

Coordinator

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MCQ Test - Analysis

ID	Start time	Completion time	Email	Name	Total points	How many frequency channels for downlink?	Points - How many frequency channels for downlink?	LoRa is ___ layer	Points - LoRa is ___ layer	Which one out of these is not LPWAN technologies?	Points - Which one out of these is not LPWAN technologies?	LoRaWAN is ___ layer	Points - LoRaWAN is ___ layer	How many default frequency channels for uplink?	Points - How many default frequency channels for uplink?	How many frequency channels for uplink?	Points - How many frequency channels for uplink?	For uplink, the maximum transmission power is limited to
1	8-5-23 14:46:11	8-5-23 14:58:42	21uec061@kamarajeng g.edu.in	SATHISKUMAR S	14	64	0	Network Layer	0	LoRa	0	Network Layer	0	8	0	7	0	25mW
2	8-5-23 14:52:03	8-5-23 14:59:27	21uec021@kamarajeng g.edu.in	SARAN V	26	5	0	Data Link layer	0	NBIoT	0	Data Link layer and Data Link Layer	1	8	0	7	0	25mW
3	8-5-23 14:50:08	8-5-23 15:00:00	21uec025@kamarajeng g.edu.in	BOOBALAN S	41	1	1	Physical Layer	1	WiFi	1	Data Link layer and Data Link Layer	1	5	0	8	1	15mW
4	8-5-23 14:47:57	8-5-23 15:01:29	21uec036@kamarajeng g.edu.in	RITHISH ARUN VARUNA M	40	8	0	Network Layer	0	NBIoT	0	Data Link layer and Data Link Layer	1	5	0	1	0	28mW
5	8-5-23 14:49:12	8-5-23 15:02:42	21uec027@kamarajeng g.edu.in	MUHAMED SABEER ALI S	16	8	0	Data Link layer	0	LoRa	0	Network Layer	0	3	1	7	0	35mW
6	8-5-23 14:45:29	8-5-23 15:03:35	21uec005@kamarajeng g.edu.in	DHARANIDHARAN R	22	1	1	Network Layer	0	SigFox	0	Network Layer	0	1	0	1	0	25mW
7	8-5-23 14:44:47	8-5-23 15:04:00	21uec033@kamarajeng g.edu.in	SHEEBA ELIZABETH.R	25	64	0	Network Layer	0	SigFox	0	Physical Layer	0	3	1	8	1	28mW
8	8-5-23 14:45:59	8-5-23 15:04:25	21uec011@kamarajeng g.edu.in	BALAJI A	25	8	0	Physical Layer	1	LoRa	0	Data Link layer and Data Link Layer	1	8	0	9	0	
9	8-5-23 14:47:28	8-5-23 15:06:00	21uec014@kamarajeng g.edu.in	ALAGU SANKARA NARAYANAN.R	37	64	0	Application Layer	0	SigFox	0	Network Layer	0	5	0	9	0	28mW
10	8-5-23 14:46:02	8-5-23 15:06:15	21uec047@kamarajeng g.edu.in	RAMJI.B.G	34	5	0	Network Layer	0	NBIoT	0	Application Layer	0	8	0	8	1	35mW
11	8-5-23 14:46:07	8-5-23 15:06:46	21uec060@kamarajeng g.edu.in	MUTHU RAAJ K	19	5	0	Network Layer	0	LoRa	0	Network Layer	0	1	0	8	1	35mW
12	8-5-23 14:46:08	8-5-23 15:07:08	21uec006@kamarajeng g.edu.in	PARTHASARATHY P	24	8	0	Physical Layer	1	SigFox	0	Application Layer	0	3	1	8	1	25mW

13	8-5-23 14:46:26	8-5-23 15:08:58	21uec031@kamarajeng g.edu.in	KEERTHANA.M	37	64	0	Physical Layer	1	SigFox	0	Physical Layer	0	8	0	8	1	28mW
14	8-5-23 14:51:21	8-5-23 15:09:02	21uec057@kamarajeng g.edu.in	VETRIVEL.B	39	64	0	Physical Layer	1	SigFox	0	Physical Layer	0	8	0	8	1	25mW
15	8-5-23 14:45:22	8-5-23 15:09:16	21uec049@kamarajeng g.edu.in	SUREKA.K	42	5	0	Physical Layer	1	NBIoT	0	Application Layer	0	8	0	8	1	25mW
16	8-5-23 14:44:36	8-5-23 15:09:21	21uec043@kamarajeng g.edu.in	YUWASRI.T	30	8	0	Physical Layer	1	NBIoT	0	Network Layer	0	3	1	8	1	15mW
17	8-5-23 14:47:03	8-5-23 15:10:20	21uec010@kamarajeng g.edu.in	NACHIYAR.S	28	64	0	Physical Layer	1	NBIoT	0	Data Link layer and Data Link Layer	1	8	0	8	1	15mW
18	8-5-23 14:47:19	8-5-23 15:10:39	21uec016@kamarajeng g.edu.in	KIRUTHIYAVAISHNAVI.S	27	8	0	Physical Layer	1	SigFox	0	Network Layer	0		0		0	35mW
19	8-5-23 14:45:11	8-5-23 15:10:41	21uec003@kamarajeng g.edu.in	DHARSHINI.S	27	8	0	Physical Layer	1	NBIoT	0	Network Layer	0	3	1	8	1	25mW
20	8-5-23 14:46:41	8-5-23 15:13:00	21uec058@kamarajeng g.edu.in	BHARATH VAI.R	41	8	0	Application Layer	0	WiFi	1	Application Layer	0	8	0	8	1	

Points - For uplink, the maximum transmission power is limited to	ABP Stands for	Points - ABP Stands for	AES encyption Key Size	Points - AES encyption Key Size	Bandwidth for LoRa allocated to channel	Points - Bandwidth for LoRa allocated to channel	What could be the LoRaWAN Indian Standard Frequency?	Points - What could be the LoRaWAN Indian Standard Frequency?	What is the modulation technique used in LoRa?	Points - What is the modulation technique used in LoRa?	I2C Protocol have _____communication	Points - I2C Protocol have _____communication	LoRa is not suitable for which applications?	Points LoRa is not suitable for which applications ?
1	Authenticate by Program	0	128 bits	1	50KHz – 500KHz	0	IN865-967 KHz	0	Chirp Spread Spectum	1	one master to one slave	0	non-citical applications	0
1	Activate by Program	0	126 bits	0	50Hz – 125kHz	0	IN865-867Hz	1	Clsp Spead Spectum	0	one master to one slave	0	non-citical applications	0
0	Activate by Personalisation	1	128 bytes	0	50KHz – 500KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	many master to many slave	1	Citical applications	1
0	Activate by Personalisation	1	128 bits	1	50KHz – 500KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	one master to one slave	0	IoT applications	0
0	Activate by Personalisation	1	128 bits	1	50KHz – 500KHz	0	IN865-967 KHz	0	Chip Spread Spectum	0	many master to one slave	0	IoT applications	0
1	Authenticate by Personalisation	0	128 bytes	0	50KHz – 500KHz	0	IN865-967 KHz	0	Chip Spread Spectum	0	one master to one slave	0	Citical applications	1
0	Authenticate by Program	0	126 bytes	0		0		0	Chirp Spread Spectum	1	one master to many slave	0	Citical applications	1
0		0	128 bits	1	50Hz – 125KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	one master to one slave	0	IoT applications	0
0	Authenticate by Personalisation	0	128 bytes	0	50KHz – 500KHz	0	IN865-967 KHz	0	Chip Spread Spectum	0	many master to many slave	1	Agicultural application	0
0	Authenticate by Program	0	128 bytes	0	50KHz – 500KHz	0	IN865-867Hz	1	Chip Spread Spectum	0	one master to one slave	0	non-citical applications	0
0	Authenticate by Program	0	126 bytes	0	50Hz – 500Hz	0	IN865-967 KHz	0	Chip Spread Spectum	0	one master to many slave	0	non-citical applications	0
1	Activate by Program	0	128 bytes	0	50Hz – 125KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	one master to one slave	0	Citical applications	1

0	Authenticate by Personalisation	0	128 bits	1	50Hz – 125KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	one master to many slave	0	non-citical applications	0
1	Authenticate by Personalisation	0	128 bits	1	50Hz – 125KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	many master to many slave	1	Citical applications	1
1	Authenticate by Personalisation	0	128 bytes	0	500Hz – 125KHz	1	IN865-867Hz	1	Chirp Spread Spectum	1	one master to many slave	0	non-citical applications	0
0	Authenticate by Personalisation	0	128 bits	1	50Hz – 125KHz	0	IN865-867Hz	1	Chirp Spread Spectum	0	many master to many slave	1	non-citical applications	0
0	Authenticate by Program	0	128 bytes	0	50Hz – 125KHz	0	IN865-867Hz	1	Chirp Spread Spectum	1	one master to many slave	0	Agricultural application	0
0	Activate by Personalisation	1	128 bits	1	500Hz – 125KHz	1	IN865-867Hz	1	Chirp Spread Spectum	1	one master to many slave	0	non-citical applications	0
1	Authenticate by Personalisation	0	126 bytes	0	500Hz – 125KHz	1	IN865-867Hz	1	Chirp Spread Spectum	0	one master to many slave	0	Citical applications	1
0	Authenticate by Program	0	128 bits	1	50Hz – 125KHz	0	IN865-867 MHz	0	Chirp Spread Spectum	0	one master to one slave	0	Citical applications	1

What are the keys used for OTAA mode of Communication?	Points - What are the keys used for OTAA mode of Communication?	What are the keys used for OTAA mode of communication?2	Points - What are the keys used for OTAA mode of communication?2	How to increase Coverage and Reduce Data Loss?	Points - How to increase Coverage and Reduce Data Loss?	If Signal strength increases then ____	Points - If Signal strength increases then ____	LoRaWAN Classes classified into:	Points - LoRaWAN Classes classified into	Which sensor can detect the nearby object	Points - Which sensor can detect the nearby object	Which frequency range is allowed to use in Europe?	Points - Which frequency range is allowed to use in Europe?	How many receive windows does a 'class A' device open after its transmission?	Points - How many receive windows does a 'class A' device open after its transmission?
Device Address, Network Session Key, App Session Key	0	App Session Key, Application ID, Device ID	0	Mounting Gateway in Higher Altitude	0	SNR increases	1	2 Classes	0	Touch Sensor	0	863 – 870 MHz	1	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR reduces	0	4 Classes	0	Proximity Sensor	1	863 – 870 MHz	1	Two	1
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR increases	1	3 Classes	1	Proximity Sensor	1	915 – 928 MHz	0	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	Increased Line of Sight	0	SNR reduces	0	3 Classes	1	Touch Sensor	0	863 – 870 MHz	1	Three	0
Device Address, Network Session Key, App Session Key	0	App Session Key, Application ID, Device ID	0	Increased Line of Sight	0	SNR increases	1	2 Classes	0	Humidity Sensor	0	470 – 510 MHz	0	Two	1
Device EUI, Network Session Key, Application ID	0	Device Address, Network Session Key, App Session Key	0	All the above	1	SNR reduces	0	4 Classes	0	Proximity Sensor	1	915 – 928 MHz	0	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1		0	SNR increases	1	3 Classes	1	Humidity Sensor	0	863 – 870 MHz	1	Three	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	Mounting Gateway in Higher Altitude	0	SNR reduces	0	2 Classes	0	Humidity Sensor	0	863 – 870 MHz	1	One	0
Device EUI, Application EUI, App Key	0	Device Address, Network Session Key, App Session Key	0	All the above	1	SNR will become zero	0	3 Classes	1	Proximity Sensor	1	470 – 510 MHz	0	Two	1
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR increases	1	3 Classes	1	Proximity Sensor	1	863 – 870 MHz	1	Two	1
Device EUI, Network Session Key, Application ID	0	Device EUI, Network Session Key, Application ID	0	All the above	1	SNR will become zero	0	2 Classes	0	Humidity Sensor	0	863 – 870 MHz	1	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR will become zero	0	2 Classes	0	Humidity Sensor	0	470 – 510 MHz	0	Two	1

Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR reduces	0	3 Classes	1	Proximity Sensor	1	470 – 510 MHz	0	Two	1
App Session Key, Application ID, Device ID	1	Device EUI, Network Session Key, Application ID	0	All the above	1	No change in SNR	0	3 Classes	1	Proximity Sensor	1	863 – 870 MHz	1	Two	1
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	Increased EIRP of Gateway	0	SNR increases	1	3 Classes	1	Proximity Sensor	1	863 – 870 MHz	1	Two	1
Device EUI, Network Session Key, Application ID	0	Device EUI, Application EUI, App Key	1	Increased Line of Sight	0	SNR increases	1	3 Classes	1	Proximity Sensor	1	470 – 510 MHz	0	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	Increased Line of Sight	0	SNR increases	1	3 Classes	1	Touch Sensor	0	863 – 870 MHz	1	Two	1
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR will become zero	0	3 Classes	1	Proximity Sensor	1		0	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	All the above	1	SNR increases	1	3 Classes	1	Humidity Sensor	0	863 – 870 MHz	1	One	0
Device EUI, Application EUI, App Key	0	Device EUI, Application EUI, App Key	1	Mounting Gateway in Higher Altitude	0	SNR increases	1	3 Classes	1	Proximity Sensor	1	863 – 870 MHz	1	One	0

UART protocol is similar to _____	Points - UART protocol is similar to _____	Which class must all devices support?	Points - Which class must all devices support?	Which Encryption algorithm is used in LoRaWAN for the secure transmission of data packets?	Points - Which Encryption algorithm is used in LoRaWAN for the secure transmission of data packets?	When the height of a gateway antenna increases the coverage of the gateway will ____ Stay the same	Points - When the height of a gateway antenna increases the coverage of the gateway will ____ Stay the same	Which device class is the most energy-efficient and results in the longest battery life?	Points - Which device class is the most energy-efficient and results in the longest battery life?	Which activation method is more Secure?	Points - Which activation method is more Secure?	When was the actual term "Internet of Things" coined?	Points - When was the actual term "Internet of Things" coined?	Which of the following is false about IoT devices?	Points - Which of the following is false about IoT devices?	Which of the following is not a fundamental component of an IoT system?	Points - Which of the following is not a fundamental component of an IoT system?
MQTT Protocol	0	Class A	1	3DES	0	increase	1	Class B	0	OTAA	1	1998	0	IoT devices need microcontrollers	0	Transformer	2
SPI protocol	0	Class A	1	AES256 bit	0	no change	0	Class B	0	OTAA	1	1998	0	IoT devices need microcontrollers	0	Transformer	2
MQTT Protocol	0	Class A	1	AES256 bit	0	increase	1	Class C	0	OTAA	1	1998	0	IoT devices are completely safe	1	Transformer	2
I2C protocol	1	Class A	1	RSA	0	increase	1	Class C	0	OTAA	1	1999	1	IoT devices are completely safe	1	Transformer	2
HTTP protocol	0	Class C	0	AES128 bit	1	increase	1	Class B	0	OTAA	1		0	IoT devices use wireless technology	0	User interface	0
I2C protocol	1	Class A	1	AES256 bit	0	no change	0	Class A	1	OTAA	1	2002	0	IoT devices are completely safe	1	User interface	0
HTTP protocol	0	Class A	1	RSA	0	increase	1	Class C	0	OTAA	1	1998	0	IoT devices need microcontrollers	0	Transformer	2
MQTT Protocol	0	Class A	1	AES256 bit	0	increase	1	Class A	1	OTAA	1	2000	0	IoT devices use the internet for collecting and sharing data	0	Sensors	0
I2C protocol	1	Class A	1	AES128 bit	1	increase	1	Class A	1	OTAA	1	1999	1	IoT devices are completely safe	1	Transformer	2
MQTT Protocol	0	Class A	1	AES128 bit	1	no change	0	Class A	1	OTAA	1	1999	1	IoT devices use the internet for collecting and sharing data	0	Sensors	0
HTTP protocol	0	Class A	1	AES128 bit	1	decrease	0	Class D	0	OTAA	1	1998	0	IoT devices are completely safe	1	Transformer	2
I2C protocol	1	Class B	0	AES256 bit	0	none	0	Class A	1	OTAA	1	1999	1	IoT devices use the internet for collecting and sharing data	0	Transformer	2

I2C protocol	1	Class A	1	AES128 bit	1	no change	0	Class A	1	OTAA	1	1998	1	IoT devices are completely safe	1	Transformer	1
I2C protocol	1	Class A	1	AES128 bit	1	no change	0	Class A	1	OTAA	1	1998	1	IoT devices are completely safe	1	User interface	1
I2C protocol	1	Class A	1	AES256 bit	0	decrease	0	Class A	1	ABP	0	1998	1	IoT devices use wireless technology	0	Transformer	1
I2C protocol	1	Class B	0	AES128 bit	1	no change	0	Class A	1	OTAA	1	1998	1	IoT devices are completely safe	1	Transformer	1
HTTP protocol	0	Class C	0	AES256 bit	0	no change	0	Class A	1	OTAA	1	1998	0	IoT devices need microcontrollers	0	Sensors	0
I2C protocol	1	Class C	0	AES256 bit	0	increase	1	Class A	1	OTAA	1	2002	0	IoT devices are completely safe	1	Transformer	1
I2C protocol	1	Class C	0	AES256 bit	0	none	0	Class C	0	OTAA	1	1998	0	IoT devices are completely safe	1	Transformer	1
I2C protocol	1	Class A	1	AES128 bit	1	increase	1	Class D	0	OTAA	1	1998	0	IoT devices are completely safe	1	Transformer	1

Which layer is used for sending commands to IoT devices?	Points - Which layer is used for wireless connection to IoT devices?	Which library is used to access I2C in Arduino IoT devices?	Points - Which library is used to access I2C in Arduino IoT devices?	IoT gateway must provide _____	Points for gateway must provide _____	Which of the following protocol is used to find all the devices in the IoT?	Points - Which of the following protocol is used to find all the devices in the IoT?	What is the component of an IoT system that executes a program?	Points - What is the component of an IoT system that executes a program?	Which programming language is used by Arduino IDE IoT software for writing codes?	Points - Which programming language is used by Arduino IDE IoT software for writing codes?	MQTT is mainly used for _____	Points - MQTT is mainly used for _____	Full form of MQTT _____	Points - Full form of MQTT _____
Network layer	0	DHT11	0	Security with hardware	0	HTTP	0	A digital to analog converter	0	C/C++	2	Device communication	0	Message Queue Telegram Transport	0
Network layer	0	DHT11	0	Protocol abstraction	2	Network	0	A microcontroller	2	C/C++	2	M2M communication	2	Message Queue Telemetry Transport	2
Data link layer	2	Wire	2	Protocol abstraction	2	TCP/IP	2	A microcontroller	2	C/C++	2	Wireless communication	0	Message Queue Telemetry Transport	0
Data link layer	2	Wire	2	Protocol abstraction	2	Network	0	A microcontroller	2	C/C++	2	M2M communication	2	Message Queue Telemetry Transport	2
Data link layer	2	DHT11	0	Simple and fast installation	0	Network	0	A sensor	0	C/C++	2	Device communication	0	Message Queue Telemetry Transport	0
Network layer	0	EEPROM	0	Security with hardware	0	UDP	0	A microcontroller	2	C/C++	2	Device communication	0	Message Queue Telemetry Transport	2
Network layer	0	EEPROM	0	Simple and fast installation	0	HTTP	0	A microcontroller	2	C/C++	2	Wireless communication	0	Message Queue Telemetry Transport	2
Application layer	0	DHT11	0	Security with hardware	0		0	A sensor	0	C/C++	2	Wireless communication	0	Message Queue Telemetry Transport	2
Data link layer	2	Wire	2	Protocol abstraction	2	TCP/IP	2	A microcontroller	2	Java	0	M2M communication	2	Message Queue Telemetry Transport	2
Transport layer	0	Wire	2	Protocol abstraction	2	TCP/IP	2	A microcontroller	2	C/C++	2	M2M communication	2	Message Queue Telemetry Transport	2
Network layer	0	DHT11	0	Simple and fast installation	0	HTTP	0	A digital to analog converter	0	C/C++	2	Internet communication	0	Message Queue Telegram Transport	0
Application layer	0	DHT11	0	Protocol abstraction	2	HTTP	0	A sensor	0	C/C++	2	Wireless communication	0	Message Queue Telegram Transport	0

Data link layer	2	ArduinoJson	0	Data storage	0	TCP/IP	2	A microcontroller	2	C/C++	2	Wireless communication	0	Message Queue Telemetry Transport	0
Network layer	0	EEPROM	0	Simple and fast installation	0	UDP	0	A microcontroller	2	C/C++	2	M2M communication	2	Message Queuing Telemetry Transport	2
Data link layer	2	Wire	2	Simple and fast installation	0	TCP/IP	2	A microcontroller	2	C/C++	2	M2M communication	2	Message Queuing Telemetry Transport	2
Data link layer	2	ArduinoJson	0	Security with hardware	0	TCP/IP	2	An actuator	0	C/C++	2	Wireless communication	0	Message Queue Telegram Transport	0
Transport layer	0	DHT11	0	Data storage	0	Network	0	A sensor	0	C/C++	2	M2M communication	2	Message Queuing Telemetry Transport	2
Network layer	0	EEPROM	0	Simple and fast installation	0	UDP	0	A microcontroller	2	C/C++	2	Device communication	0		0
Network layer	0	DHT11	0	Data storage	0	Network	0	An actuator	0	C/C++	2	Internet communication	0	Message Queuing Telemetry Transport	2
Data link layer	2	Wire	2	Protocol abstraction	2	TCP/IP	2	A microcontroller	2	Java	0	Device communication	0	Message Queuing Telemetry Transport	2

What is the standard form of MTM pin?	Points: What is the standard form of MTM pin?	SPI device communicates in ____	Points: SPI device communicates in ____	How many pins does temperature sensor have?	Points: How many pins does temperature sensor have?	Electric motor protection has which sensor?	Points: Electric motor protection has which sensor?	Internet of Things needs a lot of network connection. What is the proposed "white space" radio standard called?	Points: Internet of Things needs a lot of network connection. What is the proposed "white space" radio standard called?	UART protocol is how wire communication ?	Points: UART protocol is how wire communication ?
Mixmpoint Input Slave Output	0	Simplex	0	4 legs	0	Touch sensor	0	Bluetooth	0	Tx, Rx	2
Master Input Slave Output	0	Both half and full duplex	0	3 legs	2	Pressure sensor	0	Weightless	2	Tx, Rx	2
Master Out Slave In	2	Half duplex	0	3 legs	2	Temperature sensor	2	Bluetooth	0	Tx, Rx	2
Master Out Slave In	2	Full duplex	2	3 legs	2	Temperature sensor	2	Bluetooth	0	Tx, Rx	2
Master Out Slave In	2	Half duplex	0	4 legs	0	Temperature sensor	2	Zigbee	0	MOSI,Tx	0
Master Input Slave Output	0	Simplex	0	3 legs	2	Temperature sensor	2	Bluetooth	0	Tx, Rx	2
Master Out Slave In	2	Both half and full duplex	0	3 legs	2	Humidity sensor	0	Bluetooth	0	Tx, Rx	2
Master Out Slave In	2	Full duplex	2	3 legs	2	Temperature sensor	2	Bluetooth	0	Tx, Rx	2
Master Input Slave Output	0	Half duplex	0	3 legs	2	Temperature sensor	2	Weightless	2	Tx, Rx	2
Master Out Slave In	2	Simplex	0	3 legs	2	Pressure sensor	0	WiMax	0	Tx, Rx	2
Master Out Slave In	2	Both half and full duplex	0	2 legs	0	Temperature sensor	2	Weightless	2	Tx, Rx	2
Master Out Slave In	2	Both half and full duplex	0	3 legs	2	Pressure sensor	0	Zigbee	0	MOSI,Tx	0

Master Out Slave In	2	Full duplex	2	3 legs	2	Temperature sensor	2	Weightless	2	Tx,SCL	0
Memory input Slave Output	0	Full duplex	2	3 legs	2	Temperature sensor	2	Weightless	2	Tx, Rx	2
Master Out Slave In	2	Full duplex	2	3 legs	2	Pressure sensor	0	Weightless	2	Tx, Rx	2
Master Out Slave In	2	Half duplex	0	3 legs	2	Pressure sensor	0	WiMax	0	Tx, Rx	2
Master Out Slave In	2	Full duplex	2	3 legs	2	Temperature sensor	2	Bluetooth	0	Tx, Rx	2
Master Out Slave In	2	Both half and full duplex	0	3 legs	2		0	Zigbee	0	Tx, Rx	2
Master Out Slave In	2	Both half and full duplex	0	3 legs	2	Pressure sensor	0	Bluetooth	0	Tx, Rx	2
Master Out Slave In	2	Full duplex	2	3 legs	2	Temperature sensor	2	Weightless	2	Tx, Rx	2

VAC Coordinator

HOD/ECE

MCQ Test - Value Added Course on Internet of Things using LORaWAN Technology

2023-2024 ODD semester - III Year ECE - Semester V (31.07.2023 to 05.08.2023)

Hi, Prathiba. When you submit this form, the owner will see your name and email address.

1. How many Frequency channels for downlink? (1 Point)

- ◯ 8
- ◯ 1
- ◯ 64
- ◯ 5

2. LoRa is ___ layer (1 Point)

- ◯ Network Layer
- ◯ Physical Layer
- ◯ Application Layer

- ◯ Data Link layer

3. Which one out of these is not LPWAN technologies? (1 Point)

- ◯ SigFox
- ◯ WiFi
- ◯ NBIoT
- ◯ LoRa

4. LoRaWAN is ___ layer (1 Point)

- ◯ Network Layer
- ◯ Physical Layer
- ◯ Application Layer
- ◯ Data Link layer and Data Link Layer

5. How many default frequency channels for uplink? (1 Point)

- ◯ 3
- ◯ 8
- ◯ 1
- ◯ 5

6. How many Frequency channels for uplink? (1 Point)

- ◯ 1

- ◯ 8
- ◯ 7
- ◯ 9

7. For uplink, the maximum transmission power is limited to (1 Point)

- ◯ 28mW
- ◯ 25mW
- ◯ 35mW
- ◯ 15mW

8. ABP Stands for (1 Point)

- ◯ Activate by Program
- ◯ Authenticate by Program
- ◯ Activate by Personalisation
- ◯ Authenticate by Personalisation

9. AES encyption Key Size (1 Point)

- ◯ 126 bytes
- ◯ 126 bits
- ◯ 128 bytes
- ◯ 128 bits

10. Bandwidth for LoRa allocated to channel (1 Point)

- 500Hz - 125KHz
- 50Hz - 500Hz
- 50KHz - 500KHz
- 50Hz - 125KHz

11. What could be the LoRaWAN Indian Standard Frequency? (1 Point)

- IN865 865Hz
- IN865 865 KHz
- IN865 865 MHz
- IN865 865 GHz

12. What is the modulation technique used in LoRa? (1 Point)

- Choco Spread Spectum
- Chirp Spread Spectum
- Cisp Spead Spectum
- Chip Spread Spectum

13. I2C Protocol have _____communication (1 Point)

- one master to one slave
- one master to many slave

- many master to one slave
- many master to many slave

14. LoRa is not suitable for which applications? (1 Point)

- Agicultural application
- Citical applications
- non-citical applications
- IoT applications

15. What are the keys used for OTAA mode of Communication? (1 Point)

- Device EUI, Application EUI, App Key
- Device Address, Network Session Key, App Session Key
- App Session Key, Application ID, Device ID
- Device EUI, Network Session Key, Application ID

16. What are the keys used for OTAA mode of Communication? (1 Point)

- Device EUI, Application EUI, App Key
- Device Address, Network Session Key, App Session Key
- App Session Key, Application ID, Device ID
- Device EUI, Network Session Key, Application ID

17. How to Increase Coverage and Reduce Data Loss? (1 Point)

- ◯ Increased EIRP of Gateway
- ◯ Mounting Gateway in Higher Altitude
- ◯ Increased Line of Sight
- ◯ All the above

18. If Signal strength increases then ___ (1 Point)

- ◯ SNR reduces
- ◯ SNR increases
- ◯ No change in SNR
- ◯ SNR will become zero

19. LoRaWAN Classes classified into (1 Point)

- ◯ 3 Classes
- ◯ 2 Classes
- ◯ 4 Classes
- ◯ 5 Classes

20. Which sensor can detect the nearby object (1 Point)

- ◯ Proximity Sensor
- ◯ Humidity Sensor
- ◯ Touch Sensor

- ◯ Pressure Sensor

21. Which frequency range is allowed to use in Europe? (1 Point)

- ◯ 915 – 928 MHz
- ◯ 863 – 870 MHz
- ◯ 470 – 510 MHz
- ◯ 902 – 928 MHz

22. How many receive windows does a 'class A' device open after its transmission? (1 Point)

- ◯ One
- ◯ Two
- ◯ Three
- ◯ Four

23. UART protocol is similar to _____ (1 Point)

- ◯ MQTT Protocol
- ◯ I2C protocol
- ◯ SPI protocol
- ◯ HTTP protocol

24. Which class must all devices suppot? (1 Point)

- ◯ Class A
- ◯ Class B
- ◯ Class C
- ◯ Class D

25. Which Encyption algoithm is used in LoRaWAN for the secure transmission of data packets? (1 Point)

- ◯ AES256 bit
- ◯ 3DES
- ◯ RSA
- ◯ AES128 bit

26. When the height of a gateway antenna increases the coverage of the gateway will ___ Stay the same (1 Point)

- ◯ no change
- ◯ decrease
- ◯ increase
- ◯ none

27. Which device class is the most energy-efficient and results in the longest battey life? (1 Point)

- ◯ Class A
- ◯ Class B

- ◯ Class C
- ◯ Class D

28. Which activation method is more Secure? (1 Point)

- ◯ OTAA
- ◯ ABP
- ◯ OBT
- ◯ ABT

29. When was the actual term "Internet of Things" coined? (1 Point)

- ◯ 1998
- ◯ 1999
- ◯ 2000
- ◯ 2002

30. Which of the following is false about IoT devices? (1 Point)

- ◯ IoT devices use the internet for collecting and sharing data
- ◯ IoT devices need microcontrollers
- ◯ IoT devices use wireless technology
- ◯ IoT devices are completely safe

31. Which of the following is not a fundamental component of an IoT system? (2 Points)

- Sensors
- Connectivity and data processing
- User interface
- Transformer

32. Which layer is used for wireless connection in IoT devices? (2 Points)

- Application layer
- Network layer
- Data link layer
- Transport layer

33. Which library is used to access I2C in Arduino IoT devices? (2 Points)

- EEPROM
- Wire
- DHT11
- ArduinoJson

34. IoT gateway must provide _____ (2 Points)

- Protocol abstraction
- Data storage

- ◯ Security with hardware
- ◯ Simple and fast installation

35. Which of the following protocol is used to link all the devices in the IoT? (2 Points)

- ◯ HTTP
- ◯ UDP
- ◯ Network
- ◯ TCP/IP

36. What is the component of an IoT system that executes a program? (2 Points)

- ◯ A sensor
- ◯ A microcontroller
- ◯ An actuator
- ◯ A digital to analog converter

37. Which programming language is used by Arduino IDE IoT software for writing codes? (2 Points)

- ◯ Python
- ◯ Java
- ◯ C/C++
- ◯ JavaScript

38. MQTT is mainly used for _____ (2 Points)

- M2M communication
- Device communication
- Internet communication
- Wireless communication

39. Full form of MQTT ____ (2 Points)

- Message Queuing Telemetry Transport
- Message Queuing Telegram Transport
- Message Queue Telegram Transport
- Message Queue Telemetry Transport

40. What is the standard form of MOSI pin? (2 Points)

- Master Input Slave Output
- Memory Input Slave Output
- Master Out Slave In
- None of the above

41. SPI device communicates in _____ (2 Points)

- Simplex
- Half duplex

- ◯ Full duplex
- ◯ Both half and full duplex

42. How many pins does temperature sensor have? (2 Points)

- ◯ 5 legs
- ◯ 2 legs
- ◯ 4 legs
- ◯ 3 legs

43. Electric motor protection has which sensor? (2 Points)

- ◯ Pressure sensor
- ◯ Touch sensor
- ◯ Temperature sensor
- ◯ Humidity sensor

44. Internet of Things needs a lot of network connection. What is the proposed "white Space" radio standard called? (2 Points)

- ◯ Bluetooth
- ◯ WiMax
- ◯ Weightless
- ◯ Zigbee

45. UART protocol is two wire communication (2 Points)

- ◯ Tx, Rx
- ◯ Tx,SCL
- ◯ Rx,SS
- ◯ MOSI,Tx

VAC Coordinator

HOD/ECE

KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution)

Department of Electronics and Communication Engineering

Value Added Course on Internet of Things using LoRaWAN Technology

31/06/2023 to 05/07/2023 (6 Days)

Student Name List

S. No.	Roll Number	Name of the Student
1	21UEC003	DHARSHINI.S
2	21UEC005	DHARANIDHARAN.R
3	21UEC006	PARTHASARATHY.P
4	21UEC010	NACHIYAR.S
5	21UEC011	BALAJI.A
6	21UEC014	ALAGU SANKARA NARAYANAN.R
7	21UEC016	KIRUTHIYAVAISHNAVI.S
8	21UEC021	SARAN.V
9	21UEC025	BOOBALAN.S
10	21UEC027	MUHAMED SABEER ALI.S
11	21UEC031	KEERTHANA.M
12	21UEC033	SHEEBA ELIZABETH.R
13	21UEC036	RITHISH ARUN VARUNA.M
14	21UEC043	YUWASRI.T
15	21UEC047	RAMJI.B.G
16	21UEC049	SUREKA.K
17	21UEC057	VETRIVEL.B
18	21UEC058	BHARATH VAJ.R
19	21UEC060	MUTHU RAAJ.K
20	21UEC061	SATHIS KUMAR S

Coordinators

Dr. S. NISHA RANI

22/7/23

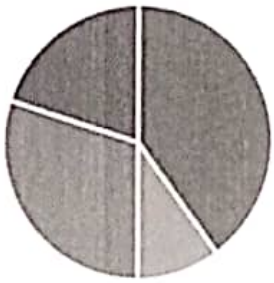
HoD/ECE

MCQ Test - Value Added Course on Internet of Things using LORaWAN Technology

20	29.7	Active
Responses	Average Score	Status

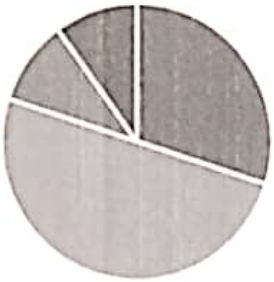
1. How many Frequency channels for downlink? (1 point)
   10% of respondents (2 of 20) answered this question correctly.

8	8	
1	2	✓
64	6	
5	4	



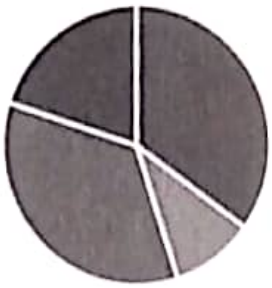
2. LoRa is ___ layer (1 point)
   50% of respondents (10 of 20) answered this question correctly.

Network Layer	6	
Physical Layer	10	✓
Application Layer	2	
Data Link layer	2	



3. Which one out of these is not LPWAN technologies? (1 point)
10% of respondents (2 of 20) answered this question correctly.

SigFox	7	
WiFi	2	✓
NBIoT	7	
LoRa	4	

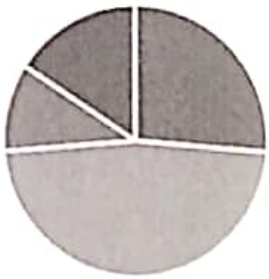


4. LoRaWAN is ___ layer (1 point)
25% of respondents (5 of 20) answered this question correctly.

Network Layer	8	
Physical Layer	3	
Application Layer	4	
Data Link layer and Data Link La...	5	✓

5. How many default frequency channels for uplink? (1 point)
26% of respondents (5 of 19) answered this question correctly.

3	5	✓
8	9	
1	2	
5	3	



6. How many Frequency channels for uplink? (1 point)
63% of respondents (12 of 19) answered this question correctly

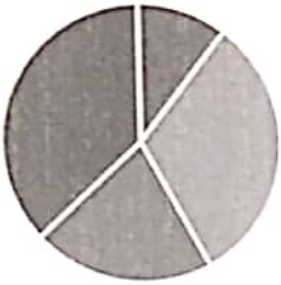
1	2	
8	12	✓
7	3	
9	2	

7. For uplink, the maximum transmission power is limited to (1 point)
39% of respondents (7 of 18) answered this question correctly.

28mW	4	
25mW	7	✓
35mW	4	
15mW	3	

8. ABP Stands for (1 point)
21% of respondents (4 of 19) answered this question correctly.

Activate by Program	2	
Authenticate by Program	6	
Activate by Personalisation	4	✓
Authenticate by Personalisation	7	



9. AES encyption Key Size (1 point)

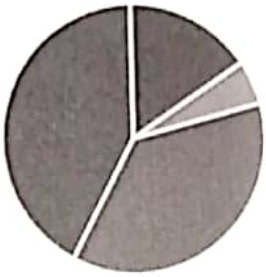
45% of respondents (9 of 20) answered this question correctly.

126 bytes	3	
126 bits	1	
128 bytes	7	
128 bits	9	✓

10. Bandwidth for LoRa allocated to channel (1 point)

16% of respondents (3 of 19) answered this question correctly.

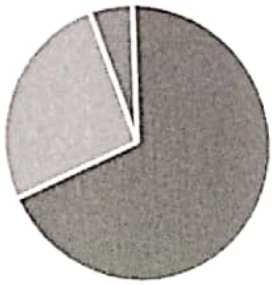
500Hz – 125KHz	3	✓
50Hz – 500Hz	1	
50KHz – 500KHz	7	
50Hz – 125KHz	8	



11. What could be the LoRaWAN Indian Standard Frequency? (1 point)

68% of respondents (13 of 19) answered this question correctly.

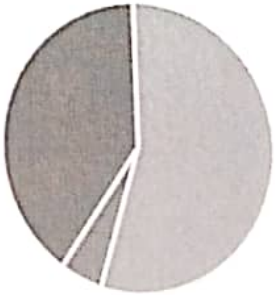
IN865-867Hz	13	✓
IN865-967 KHz	5	
IN965-867 MHz	1	
IN895-867 GHz	0	



12. What is the modulation technique used in LoRa? (1 point)

55% of respondents (11 of 20) answered this question correctly.

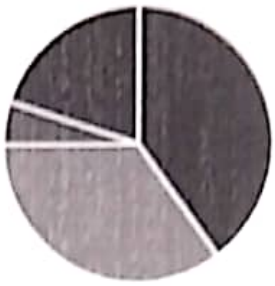
Choco Spread Spectum	0	
Chirp Spread Spectum	11	✓
Cisp Spead Spectum	1	
Chip Spread Spectum	8	



13. I2C Protocol have _____communication (1 point)

20% of respondents (4 of 20) answered this question correctly

one master to one slave	8	
one master to many slave	7	
many master to one slave	1	
many master to many slave	4	✓



14. LoRa is not suitable for which applications? (1 point)

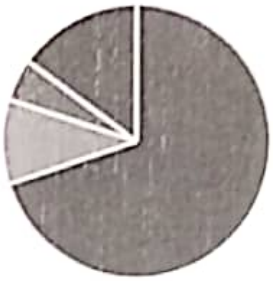
35% of respondents (7 of 20) answered this question correctly.

Agicultural application	2	
Citical applications	7	✓
non-citical applications	8	
IoT applications	3	

15. What are the keys used for OTAA mode of Communication? (1 point)

5% of respondents (1 of 20) answered this question correctly.

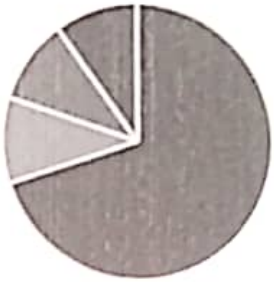
Device EUI, Application EUI, App...	14	
Device Address, Network Sessio...	2	
App Session Key, Application ID,...	1	✓
Device EUI, Network Session Ke...	3	



16. What are the keys used for OTAA mode of Communication? (1 point)

70% of respondents (14 of 20) answered this question correctly.

Device EUI, Application EUI, App...	14	✓
Device Address, Network Sessio...	2	
App Session Key, Application ID,...	2	
Device EUI, Network Session Ke...	2	



17. How to Increase Coverage and Reduce Data Loss? (1 point)

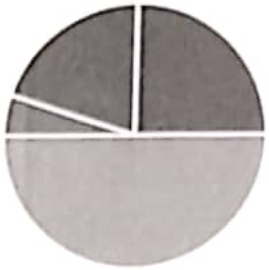
58% of respondents (11 of 19) answered this question correctly.

Increased EIRP of Gateway	1
Mounting Gateway in Higher Alt.	3
Increased Line of Sight	4
All the above	11 ✓

18. If Signal strength increases then ___ (1 point)

50% of respondents (10 of 20) answered this question correctly.

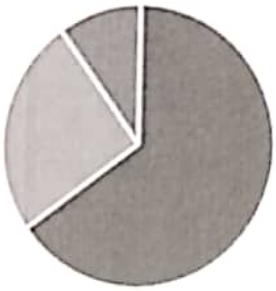
SNR reduces	5
SNR increases	10 ✓
No change in SNR	1
SNR will become zero	4



19. LoRaWAN Classes classified into (1 point)

65% of respondents (13 of 20) answered this question correctly.

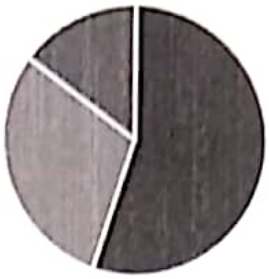
3 Classes	13 ✓
2 Classes	5
4 Classes	2
5 Classes	0



20. Which sensor can detect the nearby object (1 point)

55% of respondents (11 of 20) answered this question correctly.

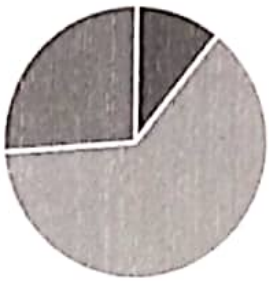
Proximity Sensor	11	✓
Humidity Sensor	6	
Touch Sensor	3	
Pressure Sensor	0	



21. Which frequency range is allowed to use in Europe? (1 point)

63% of respondents (12 of 19) answered this question correctly.

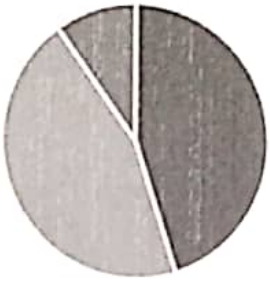
915 – 928 MHz	2	
863 – 870 MHz	12	✓
470 – 510 MHz	5	
902 – 928 MHz	0	



22. How many receive windows does a 'class A' device open after its transmission? (1 point)

45% of respondents (9 of 20) answered this question correctly.

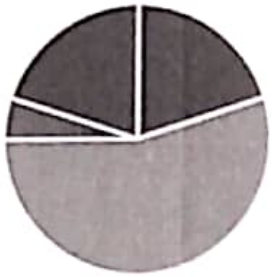
One	9	
Two	9	✓
Three	2	
Four	0	



23. UART protocol is similar to _____ (1 point)

55% of respondents (11 of 20) answered this question correctly.

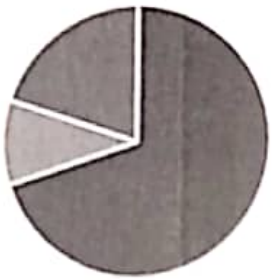
MQTT Protocol	4	
I2C protocol	11	✓
SPI protocol	1	
HTTP protocol	4	



24. Which class must all devices suppot? (1 point)

70% of respondents (14 of 20) answered this question correctly.

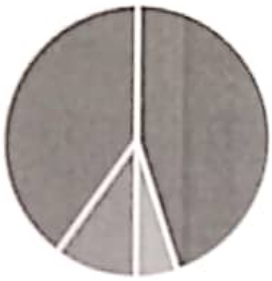
Class A	14	✓
Class B	2	
Class C	4	
Class D	0	



25. Which Encyption algoithm is used in LoRaWAN for the secure transmission of data packets? (1 point)

40% of respondents (8 of 20) answered this question correctly.

AES256 bit	9	
3DES	1	
RSA	2	
AES128 bit	8	✓



26. When the height of a gateway antenna increases the coverage of the gateway will ___ Stay the same (1 point)

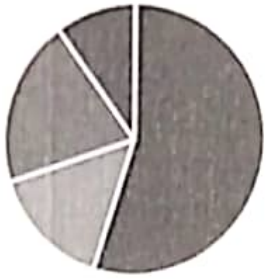
45% of respondents (9 of 20) answered this question correctly.

no change	7	
decrease	2	
increase	9	✓
none	2	

27. Which device class is the most energy-efficient and results in the longest battey life? (1 point)

55% of respondents (11 of 20) answered this question correctly.

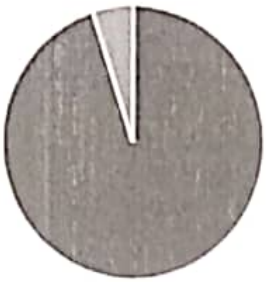
Class A	11	✓
Class B	3	
Class C	4	
Class D	2	



28. Which activation method is more Secure? (1 point)

95% of respondents (19 of 20) answered this question correctly.

OTAA	19	✓
ABP	1	
OBT	0	
ABT	0	



29. When was the actual term 'Internet of Things' coined? (1 point)

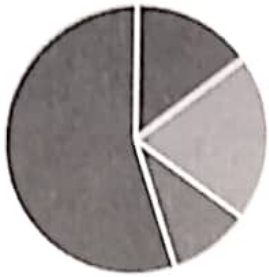
42% of respondents (8 of 19) answered this question correctly.

1998	8	
1999	8	✓
2000	1	
2002	2	

30. Which of the following is false about IoT devices? (1 point)

55% of respondents (11 of 20) answered this question correctly.

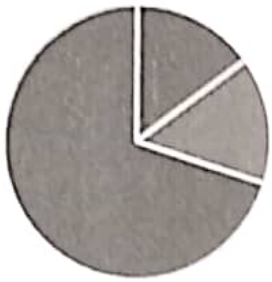
IoT devices use the internet for	3	
IoT devices need microcontrollers	4	
IoT devices use wireless technol	2	
IoT devices are completely safe	11	✓



31. Which of the following is not a fundamental component of an IoT system? (2 points)

70% of respondents (14 of 20) answered this question correctly.

Sensors	3	
Connectivity and data processing	0	
User interface	3	
Transformer	14	✓



32. Which layer is used for wireless connection in IoT devices? (2 points)
40% of respondents (8 of 20) answered this question correctly.

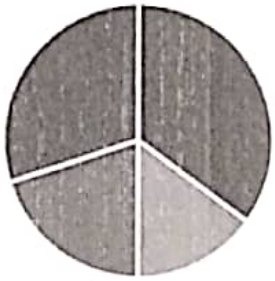
Application layer	2	
Network layer	8	
Data link layer	8	✓
Transport layer	2	

33. Which library is used to access I2C in Arduino IoT devices? (2 points)
30% of respondents (6 of 20) answered this question correctly.

EEPROM	4	
Wire	6	✓
DHT11	8	
ArduinoJson	2	

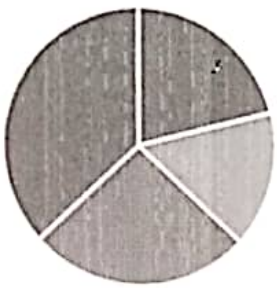
34. IoT gateway must provide _____ (2 points)
35% of respondents (7 of 20) answered this question correctly.

Protocol abstraction	7	✓
Data storage	3	
Security with hardware	4	
Simple and fast installation	6	



35. Which of the following protocol is used to link all the devices in the IoT? (2 points)
37% of respondents (7 of 19) answered this question correctly.

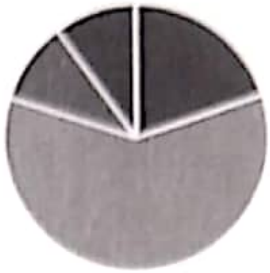
HTTP	4	
UDP	3	
Network	5	
TCP/IP	7	✓



36. What is the component of an IoT system that executes a program? (2 points)

60% of respondents (12 of 20) answered this question correctly

A sensor	4	
A microcontroller	12	✓
An actuator	2	
A digital to analog converter	2	



37. Which programming language is used by Arduino IDE IoT software for writing codes? (2 points)

90% of respondents (18 of 20) answered this question correctly

Python	0	
Java	2	
C/C++	18	✓
JavaScript	0	

38. MQTT is mainly used for _____ (2 points)

35% of respondents (7 of 20) answered this question correctly.

M2M communication	7	✓
Device communication	5	
Internet communication	2	
Wireless communication	6	

39. Full form of MQTT ____ (2 points)

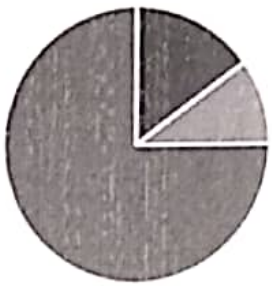
58% of respondents (11 of 19) answered this question correctly.

Message Queuing Telemetry Tra...	11	✓
Message Queuing Telegram Tra...	1	
Message Queue Telegram Trans...	3	
Message Queue Telemetry Trans...	4	

40. What is the standard form of MOSI pin? (2 points)

75% of respondents (15 of 20) answered this question correctly.

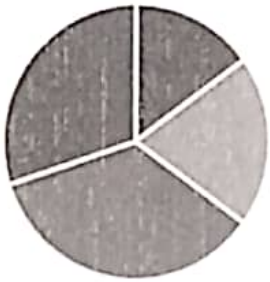
Master Input Slave Output	3	
Memory Input Slave Output	2	
Master Out Slave In	15	✓
None of the above	0	



41. SPI device communicates in _____ (2 points)

35% of respondents (7 of 20) answered this question correctly.

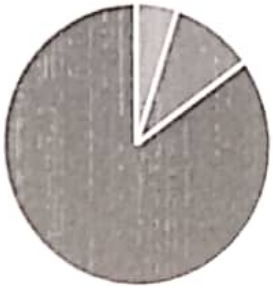
Simplex	3	
Half duplex	4	
Full duplex	7	✓
Both half and full duplex	6	



42. How many pins does temperature sensor have? (2 points)

85% of respondents (17 of 20) answered this question correctly.

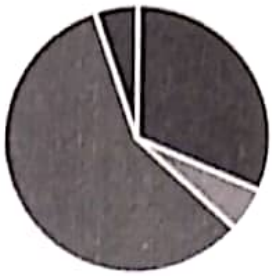
5 legs	0	
2 legs	1	
4 legs	2	
3 legs	17	✓



43. Electric motor protection has which sensor? (2 points)

58% of respondents (11 of 19) answered this question correctly.

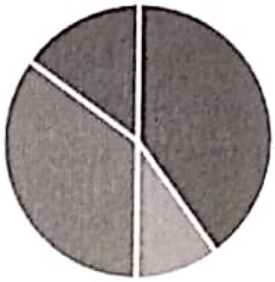
Pressure sensor	6	
Touch sensor	1	
Temperature sensor	11	✓
Humidity sensor	1	



44. Internet of Things needs a lot of network connection. What is the proposed "white Space" radio standard called? (2 points)

35% of respondents (7 of 20) answered this question correctly.

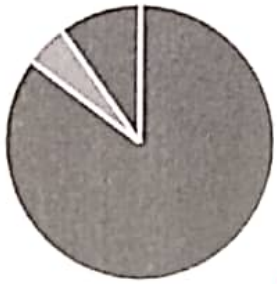
Bluetooth	8	
WiMax	2	
Weightless	7	✓
Zigbee	3	



45. UART protocol is two wire communication (2 points)

85% of respondents (17 of 20) answered this question correctly.

Tx, Rx	17	✓
Tx,SCL	1	
Rx,SS	0	
MOSI,Tx	2	



VAC Coordinator

HOD/ECE

Review: MCQ Test - Value Added Course on Internet of Things using LORaWAN Technology

Respondent
3 BOOBALAN.S

09:53
Time to complete

41/60
Points

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

1. How many Frequency channels for downlink?

- 8
- 1 ✓
- 64
- 5

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

2. LoRa is ___ layer

- Network Layer
- Physical Layer ✓
- Application Layer
- Data Link layer

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

3. Which one out of these is not LPWAN technologies?

- SigFox
- WiFi ✓
- NBIoT
- LoRa

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

4. LoRaWAN is ___ layer

- Network Layer
- Physical Layer
- Application Layer
- Data Link layer and Data Link Layer ✓

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

5. How many default frequency channels for uplink?

- 3 ✓
- 8
- 1
- 5

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

6. How many Frequency channels for uplink?

- 1
- 8 ✓
- 7
- 9

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

7. For uplink, the maximum transmission power is limited to

- 28mW
- 25mW ✓
- 35mW
- 15mW

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

8. ABP Stands for

- Activate by Program
- Authenticate by Program
- Activate by Personalisation ✓
- Authenticate by Personalisation

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

9. AES encyption Key Size

- 126 bytes
- 126 bits
- 128 bytes
- 128 bits ✓

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

10. Bandwidth for LoRa allocated to channel

- 500Hz - 125KHz ✓
- 50Hz - 500Hz
- 50KHz - 500KHz
- 50Hz - 125KHz

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

11. What could be the LoRaWAN Indian Standard Frequency?

- IN865-867Hz ✓
- IN865-967 KHz
- IN965-867 MHz
- IN895-867 GHz

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

12. What is the modulation technique used in LoRa?

- Choco Spread Spectum
- Chirp Spread Spectum ✓
- Cisp Spead Spectum
- Chip Spread Spectum

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

13. I2C Protocol have _____communication

- one master to one slave
- one master to many slave
- many master to one slave
- many master to many slave ✓

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

14. LoRa is not suitable for which applications?

- Agicultural application
- Citical applications ✓
- non-citical applications
- IoT applications

✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

15. What are the keys used for OTAA mode of Communication?

- Device EUI, Application EUI, App Key
- Device Address, Network Session Key, App Session Key
- App Session Key, Application ID, Device ID ✓
- Device EUI, Network Session Key, Application ID

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

16. What are the keys used for OTAA mode of Communication?

- Device EUI, Application EUI, App Key ✓
- Device Address, Network Session Key, App Session Key
- App Session Key, Application ID, Device ID
- Device EUI, Network Session Key, Application ID

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

17. How to Increase Coverage and Reduce Data Loss?

- Increased EIRP of Gateway
- Mounting Gateway in Higher Altitude
- Increased Line of Sight
- All the above ✓

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

18. If Signal strength increases then ___

- SNR reduces
- SNR increases ✓
- No change in SNR
- SNR will become zero

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

19. LoRaWAN Classes classified into

- 3 Classes ✓
- 2 Classes
- 4 Classes
- 5 Classes

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

20. Which sensor can detect the nearby object

- Proximity Sensor ✓
- Humidity Sensor
- Touch Sensor
- Pressure Sensor

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

21. Which frequency range is allowed to use in Europe?

- 915 – 928 MHz
- 863 – 870 MHz ✓
- 470 – 510 MHz
- 902 – 928 MHz

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

22. How many receive windows does a 'class A' device open after its transmission?

- One
- Two ✓
- Three
- Four

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

23. UART protocol is similar to _____

- MQTT Protocol
- I2C protocol ✓
- SPI protocol
- HTTP protocol

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

24. Which class must all devices suppot?

- (●) Class A ✓
- ( ) Class B
- ( ) Class C
- ( ) Class D

✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

25. Which Encyption algoithm is used in LoRaWAN for the secure transmission of data packets?

- (●) AES256 bit
- ( ) 3DES
- ( ) RSA
- ( ) AES128 bit ✓

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

26. When the height of a gateway antenna increases the coverage of the gateway will ___ Stay the same

- ( ) no change
- ( ) decrease
- (●) increase ✓
- ( ) none

✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

27. Which device class is the most energy-efficient and results in the longest battey life?

- ( ) Class A ✓
- ( ) Class B
- (●) Class C
- ( ) Class D

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

28. Which activation method is more Secure?

- OTAA ✓
- ABP
- OBT
- ABT

✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

29. When was the actual term "Internet of Things" coined?

- 1998
- 1999 ✓
- 2000
- 2002

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

30. Which of the following is false about IoT devices?

- IoT devices use the internet for collecting and sharing data
- IoT devices need microcontrollers
- IoT devices use wireless technology
- IoT devices are completely safe ✓

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

31. Which of the following is not a fundamental component of an IoT system?

- Sensors
- Connectivity and data processing
- User interface
- Transformer ✓

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

32. Which layer is used for wireless connection in IoT devices?

- Application layer
- Network layer
- Data link layer ✓
- Transport layer

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

33. Which library is used to access I2C in Arduino IoT devices?

- EEPROM
- Wire ✓
- DHT11
- ArduinoJson

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2 / 2 pts
Auto-graded

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- Protocol abstraction ✓
- Data storage
- Security with hardware
- Simple and fast installation

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

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- HTTP
- UDP
- Network
- TCP/IP ✓

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2 / 2 pts
Auto-graded

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- A microcontroller ✓
- An actuator
- A digital to analog converter

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2 / 2 pts
Auto-graded

37. Which programming language is used by Arduino IDE IoT software for writing codes?

- Python
- Java
- C/C++ ✓
- JavaScript

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

38. MQTT is mainly used for _____

- M2M communication ✓
- Device communication
- Internet communication
- Wireless communication

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

39. Full form of MQTT ____

- Message Queuing Telemetry Transport ✓
- Message Queuing Telegram Transport
- Message Queue Telegram Transport
- Message Queue Telemetry Transport

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

44. Internet of Things needs a lot of network connection. What is the proposed "white Space" radio standard called?

- (●) Bluetooth
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- ( ) Weightless ✓
- ( ) Zigbee

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2 / 2 pts
Auto-graded

45. UART protocol is two wire communication

- (●) Tx, Rx ✓
- ( ) Tx,SCL
- ( ) Rx,SS
- ( ) MOSI,Tx

VAC coordinator

HOD / ECE

Review: MCQ Test - Value Added Course on Internet of Things using LORaWAN Technology

Respondent
5 MUHAMED SABEER ALI S

13:30
Time to complete

16/60
Points

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

1. How many Frequency channels for downlink?

- 8
- 1 ✓
- 64
- 5

✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

2. LoRa is __ layer

- Network Layer
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✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

3. Which one out of these is not LPWAN technologies?

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✕ Incorrect 0/1 Points

0 / 1 pt
Auto-graded

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✓ Correct 1/1 Points

1 / 1 pt
Auto-graded

5. How many default frequency channels for uplink?

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✕ Incorrect 0/1 Points

0 / 1 pt
Auto-graded

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✕ Incorrect 0/1 Points

0 / 1 pt
Auto-graded

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✓ **Correct** 1/1 Points

1 / 1 pt
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Auto-graded

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✕ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

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1 / 1 pt
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0 / 1 pt
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0 / 1 pt
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✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

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0 / 1 pt
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0 / 1 pt
Auto-graded

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- Class C
- Class D

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

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- AES128 bit ✓

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1 / 1 pt
Auto-graded

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✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

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- Class A ✓
- Class B
- Class C
- Class D

✓ **Correct** 1/1 Points

1 / 1 pt
Auto-graded

28. Which activation method is more Secure?

- OTAA ✓
- ABP
- OBT
- ABT

✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

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No answer provided.

✗ **Incorrect** 0/1 Points

0 / 1 pt
Auto-graded

30. Which of the following is false about IoT devices?

- IoT devices use the internet for collecting and sharing data
- IoT devices need microcontrollers
- IoT devices use wireless technology
- IoT devices are completely safe ✓

✗ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

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- Sensors
- Connectivity and data processing
- User interface
- Transformer ✓

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

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✕ **Incorrect** 0/2 Points

0 / 2 pts
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- EEPROM
- Wire ✓
- DHT11
- ArduinoJson

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

34. IoT gateway must provide _____

- Protocol abstraction ✓
- Data storage
- Security with hardware
- Simple and fast installation

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

35. Which of the following protocol is used to link all the devices in the IoT?

- HTTP
- UDP
- Network
- TCP/IP ✓

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

36. What is the component of an IoT system that executes a program?

- A sensor
- A microcontroller ✓
- An actuator
- A digital to analog converter

✓ **Correct** 2/2 Points

1 / 1 pts
Auto-graded

37. Which programming language is used by Arduino IDE IoT software for writing codes?

- Python
- Java
- C/C++ ✓
- JavaScript

✗ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

38. MQTT is mainly used for _____

- M2M communication ✓
- Device communication
- Internet communication
- Wireless communication

✗ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

39. Full form of MQTT ____

- Message Queuing Telemetry Transport ✓
- Message Queuing Telegram Transport
- Message Queue Telegram Transport
- Message Queue Telemetry Transport

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

40. What is the standard form of MOSI pin?

- Master Input Slave Output
- Memory Input Slave Output
- Master Out Slave In ✓
- None of the above

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

41 SPI device communicates in _____

- Simplex
- Half duplex
- Full duplex ✓
- Both half and full duplex

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

42 How many pins does temperature sensor have?

- 5 legs
- 2 legs
- 4 legs
- 3 legs ✓

✓ **Correct** 2/2 Points

2 / 2 pts
Auto-graded

43 Electric motor protection has which sensor?

- Pressure sensor
- Touch sensor
- Temperature sensor ✓
- Humidity sensor

✕ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

44 Internet of Things needs a lot of network connection. What is the proposed "white Space" radio standard called?

- Bluetooth
- WiMax
- Weightless ✓
- Zigbee

✗ **Incorrect** 0/2 Points

0 / 2 pts
Auto-graded

45. UART protocol is two wire communication

- Tx, Rx ✓
- Tx,SCL
- Rx,SS
- MOSI,Tx

VAC coordinator

HOD/ECE

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COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
S.P.G. Chidambara Nadar - G. Nagammal Campus
K.V.S. Nagar, K. Vellakulam - 625 701 (Dist.) VIRUDHUNAGAR)

Department Electronics and Communication Engineering

Value Added Course on Internet of things using LoRaWAN Technology

Event Date: 31.07.2023 to 05.08.2023

Mark Statement

Department: ECE
Year: III
Regulation: 2021
Semester: V

Sl. No	Roll No.	Reg. No.	Student Name	Internal Marks (40)	External Marks (60)	Total (100)
1.	21UEC003	920421106010	DHARSHINI.S	35	27	62
2.	21UEC005	920421106008	DHARANIDHARAN.R	32	22	54
3.	21UEC006	920421106029	PARTHASARATHY.P	36	24	60
4.	21UEC010	920421106024	NACHIYAR.S	38	28	66
5.	21UEC011	920421106005	BALAJI.A	34	25	59
6.	21UEC014	920421106003	ALAGUSANKARANA RAYANAN.R	36	37	73
7.	21UEC016	920421106020	KIRUTHIYA VAISHNAVI.S	40	27	67
8.	21UEC021	920421106038	SARAN.V	31	26	57
9.	21UEC025	920421106006	BOOBALAN.S	40	41	81
10.	21UEC027	920421106022	MUHAMED SABEER ALI.S	36	16	52
11.	21UEC031	920421106018	KEERTHANA.M	33	37	70
12.	21UEC033	920421106042	SHEEBA ELIZABETH.R	37	25	62
13.	21UEC036	920421106037	RITHISH ARUNVARNA.M	37	40	77
14.	21UEC043	920421106055	YUWASRI.T	32	30	62
15.	21UEC047	920421106034	RAMJI.B.G	38	34	72
16.	21UEC049	920421106048	SUREKA.K	32	42	74
17.	21UEC057	920421106305	VETRIVEL.B	39	39	78
18.	21UEC058	920421106301	BHARATH VAJ.R	39	41	80
19.	21UEC060	920421106302	MUTHU RAAJ.K	36	19	55
20.	21UEC061	920421106303	SATHISKUMAR.S	36	14	50

Sighature with Seal

(Dr.K.Subramanian)

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S.P.G.Chidambara Nadar - C.Nagammal Campus
S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR).

Value Added Course on Internet of Things using LoRAWAN Technology (31.07.2023 to 05.08.2023)
Department of Electronics and Communication Engineering

Sl.No	Roll Number	Register Number	Name of the Student	Presentation (10mark)	Content & Deliverable (5mark)	Progress of work (5 mark)	Queries (5 mark)	Presentation (25 marks	Document (15 marks)	Total (40 marks)
1	21UEC003	920421106010	DHARSHINI.S	4	4	8	4	20	15	35
2	21UEC005	920421106008	DHARANIDHARAN.R	4	3	8	3	18	14	32
3	21UEC006	920421106029	PARTHASARATHY.P	5	4	9	4	22	14	36
4	21UEC010	920421106024	NACHIYAR.S	5	5	9	4	23	15	38
5	21UEC011	920421106005	BALAJI.A	4	4	8	3	19	15	34
6	21UEC014	920421106003	ALAGUSANKARANARAYANAN.R	5	4	9	4	22	14	36
7	21UEC016	920421106020	KIRUTHIYA VAISHNAVI.S	5	5	10	5	25	15	40
8	21UEC021	920421106038	SARAN.V	4	3	7	3	17	14	31
9	21UEC025	920421106006	BOOBALAN.S	5	5	10	5	25	15	40

Sl.No	Roll Number	Register Number	Name of the Student	Presentation (5mark)	Content & Deliverable (5mark)	Progress of work (10 mark)	Queries (5 mark)	Presentation (25 marks	Document (15 marks)	Total (40 marks)
10	21UEC027	920421106022	MUHAMED SABEER ALI.S	5	4	9	4	22	14	36
11	21UEC031	920421106018	KEERTHANA.M	4	4	7	4	19	14	33
12	21UEC033	920421106042	SHEEBA ELIZABETH.R	4	4	10	4	22	15	37
13	21UEC036	920421106037	RITHISH ARUNVARNA.M	5	5	9	4	23	14	37
14	21UEC043	920421106055	YUWASRI.T	4	3	7	4	18	14	32
15	21UEC047	920421106034	RAMJI.B.G	5	5	9	5	24	14	38
16	21UEC049	920421106048	SUREKA.K	4	4	6	3	17	15	32
17	21UEC057	920421106305	VETRIVEL.B	5	5	10	5	25	14	39
18	21UEC058	920421106301	BHARATH VAJ.R	5	5	10	5	25	14	39
19	21UEC060	920421106302	MUTHU RAAJ.K	4	4	9	5	22	14	36
20	21UEC061	920421106303	SATHISKUMAR.S	4	4	9	5	22	14	36

5/5/23

Feedback - Value Added Course - Internet of Things using LoRaWAN Technology

Date : 31.07.2023 to 05.08.2023

Hi, Prathiba. When you submit this form, the owner will see your name and email address.

* Required

1. Name of the student *

Enter your answer

2. Roll Number *

Enter your answer

3. Department *

Enter your answer

4. Whether objectives of the Value Added Course Met? *

- ◯ Completely agree
- ◯ Strongly agree
- ◯ Agree
- ◯ Partly Agree
- ◯ Disagree

5. Was the Program sequence well planned? *

- ◯ Completely agree
- ◯ Strongly agree
- ◯ Agree
- ◯ Partly Agree
- ◯ Disagree

6. Were the lectures clear and easy to understand? *

- ◯ Completely Agree
- ◯ Option 2
- ◯ Strongly Agree
- ◯ Agree
- ◯ Partly Agree
- ◯ Disagree

7. Was the instructor encouraged in the interaction? *

- ◯ Completely Agree
- ◯ Strongly Agree
- ◯ Agree
- ◯ Partly Agree
- ◯ Disagree

8. Whether the information presented at this event was highly beneficial. *

- ◯ Completely Agree
- ◯ Strongly Agree
- ◯ Agree
- ◯ Partly Agree
- ◯ Disagree

9. Whether the handson given in the value added course was Good *

- ◯ Completely Agree
- ◯ Strongly Agree
- ◯ Agree
- ◯ Partly Agree
- ◯ Disagree

10. Comments / Suggestions *

Enter your answer

VAC coordinator

HOD/ECE

Feedback - Value Added Course - Internet of Things using LoRaWAN Technology

20	01:27	Active
Responses	Average time to complete	Status

1. Name of the student (0 point)

20
Responses

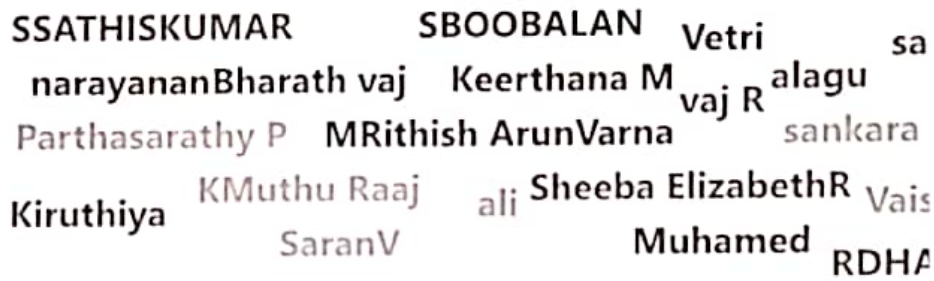
Latest Responses

"Bharath vaj R"

"Kiruthiya Vaishnavi S "

"S.Dharshini"

1 respondents (5%) answered **MRithish ArunVarna** for this question.

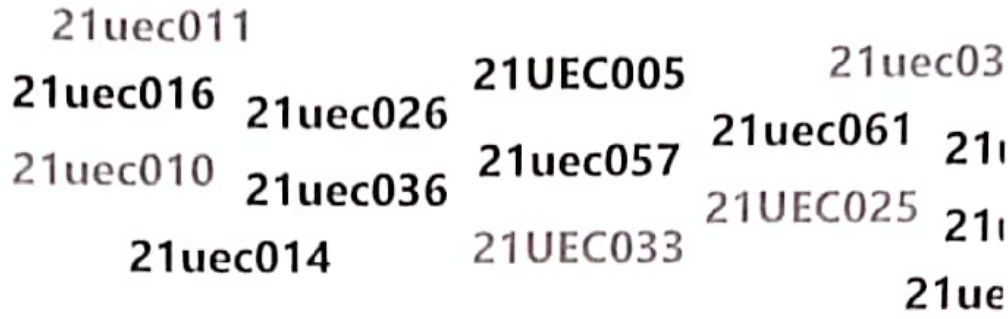


2. Roll Number (0 point)

20
Responses

Latest Responses
"21uec058"
"21uec016"
"21uec003"

1 respondents (**5**%) answered **21uec057** for this question.



3. Department (0 point)

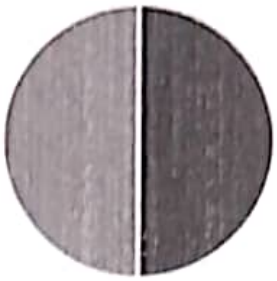
20
Responses

Latest Responses
"Electronics and communication engineering "
"ECE "
"ECE"

13 respondents (**65**%) answered **Ece** for this question.

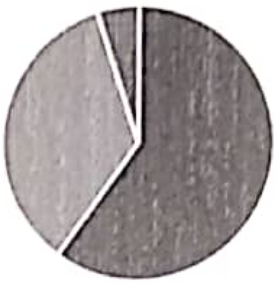
4. Whether objectives of the Value Added Course Met? (0 point)

Completely agree	10
Strongly agree	10
Agree	0
Partly Agree	0
Disagree	0



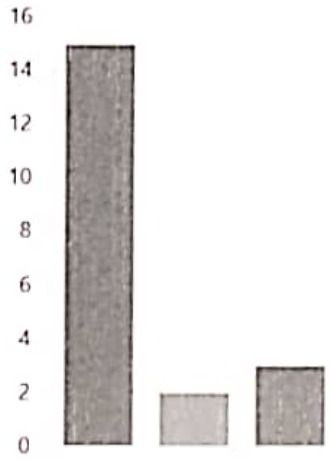
5. Was the Program sequence well planned? (0 point)

Completely agree	12
Strongly agree	7
Agree	1
Partly Agree	0
Disagree	0



6. Were the lectures clear and easy to understand? (0 point)

Completely Agree	15
Option 2	2
Strongly Agree	3
Agree	0
Partly Agree	0
Disagree	0

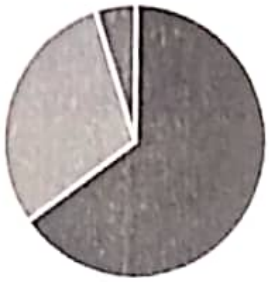


7. Was the instructor encouraged in the interaction? (0 point)

Completely Agree	14
Strongly Agree	5
Agree	1
Partly Agree	0
Disagree	0

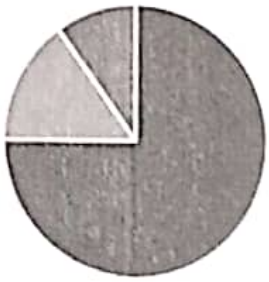
8. Whether the information presented at this event was highly beneficial. (0 point)

Completely Agree	13
Strongly Agree	6
Agree	1
Partly Agree	0
Disagree	0



9. Whether the handson given in the value added course was Good (0 point)

Completely Agree	15
Strongly Agree	3
Agree	2
Partly Agree	0
Disagree	0



10. Comments / Suggestions (0 point)

20
Responses

Latest Responses

"Good "

"Useful for us "

"good"

7 respondents (35%) answered **Good** for this question

VAC coordinator

HOD/ECE

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COLLEGE OF ENGINEERING & TECHNOLOGY

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S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR)

Department of Electronics and Communication Engineering

Value Added Course on

Internet of Things using LoRAWAN Technology

Video and Oral Feedback Link

Event Date: 31.07.2023 to 05.08.2023

https://kcetvnrorg-my.sharepoint.com/:f:/g/personal/nisharaniece_kamarajengg_edu_in/EpVxAmruuBNOjstK4cqtPWABES3EIxzmHod4vvwwpqI4Kg?e=eEW3eQ

VAC Coordinator

HoD/ECE

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COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution - Affiliated to Anna University, Chennai)
S.P.G. Chidambara Nadar - C.Nagammal Campus
S.P.G.C. Nagar, K. Vellakulam - 625 701. (Near Virudhunagar), Madurai District.

Submitted to the SECRETARY for approval through the PRINCIPAL

Book No

SL.No 5

ECE

Date 09.06.2023

Approval may please be granted for conduct of Value added course for III ECE students of strength 20 students on 'Internet of Things Using LoRaWAN Technology' by Enthu Technology Solutions India Pvt Ltd. Coimbatore.

Tentative Date : 11.07.2023 to 15.07.2023 & 17.07.2023

Kindly request you to provide hospitality for the resource persons during the Value added course.

Enclosure : Quotation - Registration amount - Rs.1800/student

Signature of Faculty
Dr. S. NISHA RANI

9/6/2023

HOD

9/6/23

PRINCIPAL

14/6/23

OFFICE USE

Value Added Course

1) Account Head
2) Budget allotted
3) Amount committed / Spent sofar
4) Balance available

OM

Treasurer

Secretary

KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution - Affiliated to Anna University, Chennai)
S.P.G. Chidambaram Nagar - Nagamalai Campus
S.P.G.C. Nagar, K. Vellakulam - 625 701 (Near Virudhunagar), Madurai District
Submitted to the SECRETARY for approval through the PRINCIPAL

Book No.

Sl. No. 17 | ECE | Date 18.08.2023

With reference to the approval granted in Sl no 5 for conducting value added course for III ECE students on 'Internet of Things using LoRaWAN Technology' by Cellia Technologies solutions Indian Pvt Ltd, the modified registration, approval including GST is Rs. 2,124/-student. Kindly grant approval

Total number of students - 20

Enclosure: Quotation (Rs. 2124 * 20 students = Rs. 42,480/-)

18/8/2023
Signature of Faculty
S. Nisha Rani

HOD

21/8/23
PRINCIPAL

OFFICE USE

1) Account Head — Value added Course Expenses
2) Budget allotted
3) Amount committed / Spent so far
4) Balance available

OM | Treasurer | Secretary

Scanned with OKEN Scanner

KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution)

Department of Electronics and Communication Engineering

Value Added Course on Internet of Things using LoRaWAN Technology

31/06/2023 to 05/07/2023 (6 Days)

Student Name List

S. No.	Roll Number	Name of the Student
1	21UEC003	DHARSHINI.S
2	21UEC005	DHARANIDHARAN.R
3	21UEC006	PARTHASARATHY.P
4	21UEC010	NACHIYAR.S
5	21UEC011	BALAJI.A
6	21UEC014	ALAGU SANKARA NARAYANAN.R
7	21UEC016	KIRUTHIYAVAISHNAVI.S
8	21UEC021	SARAN.V
9	21UEC025	BOOBALAN.S
10	21UEC027	MUHAMED SABEER ALI.S
11	21UEC031	KEERTHANA.M
12	21UEC033	SHEEBA ELIZABETH.R
13	21UEC036	RITHISH ARUN VARUNA.M
14	21UEC043	YUWASRI.T
15	21UEC047	RAMJI.B.G
16	21UEC049	SUREKA.K
17	21UEC057	VETRIVEL.B
18	21UEC058	BHARATH VAJ.R
19	21UEC060	MUTHU RAAJ.K
20	21UEC061	SATHIS KUMAR S

Coordinators

Dr. S. NISHA RANI

22/7/23

HoD/ECE

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S.P.G.C. Nagar, K.Vellakulam - 625 701 (Near VIRUDHUNAGAR)

KAMARAJ/AO/2023-24/

27-07-2023

CIRCULAR

Department of Electronics and Communication Engineering of Kamaraj College of Engineering and Technology organizes 6 days Value Added course for III ECE students from **31.07.2023 to 05.08.2023**. The details of course are given below

Name of Value Added Course	Conducted by	Venue
Internet of Things Using LoRaWAN Technology	Enthu Technology Solutions India Pvt. Ltd, Coimbatore	Embedded Lab (ECE Lab I)

PRINCIPAL

27/7/23

Copy to:

1. To be read in III year ECE Dept. Class Rooms
2. Circulated to all the ECE Dept. Teaching Staff Members through their Mail ID
3. Dean (Academics)
4. Superintendent / Administrative Office
5. HoD / ECE
6. File

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S.P.G. Chidambara Nadar - K. Nagammal Campus
S.P.G.C. Nagar, K. Vellakulam - 625 701 (Post), VIRUDHUNAGAR)

Department of Electronics and Communication Engineering

VALUE ADDED COURSE ON

"Internet of Things Using LoRaWAN Technology"
"IoT Application Design using Raspberry Pi and Python"
AND
" Deep Learning"

Resource Persons:
Dr. K. Subramanian, Enthu Technology Solution India Pvt. Ltd., Coimbatore
Mr. Jegadeswaran R, Enthu Technology Solution India Pvt. Ltd., Coimbatore
Mr. Ramachandiran R, Pantech eLearning Private Ltd., Chennai

----------**Inaugural Function**----------

Date: 31-07-2023 Time: 9.15 AM

Venue: CSE Conference Hall 1 (Ground Floor – D Block)

Welcome Address	: Dr. T. Prathiba, Assistant Professor / ECE
Inaugural Address	: Dr. R. Suresh Babu, Professor & Head / ECE, Dean Academic (Courses) Kamaraj College of Engineering and Technology.
Felicitation	: Dr. S. Senthil Principal Kamaraj College of Engineering and Technology.

----------Valedictory Function----------

Date: 05-08-2023 Time: 3.00 PM

Venue: CSE Conference Hall 1 (Ground Floor – D Block)

Valedictory Address	: Dr. R. Suresh Babu, Professor & Head / ECE
Vote of Thanks	: Dr. S. Nisha Rani, Assistant Professor / ECE

Enthutech

Enthu Technology Solutions India Pvt Ltd
Plot No: 12, P.M.R Layout, 5th Street, Block - B,
Deepa Mill Road, Goldwins, Civil Aerodrome Post,
Coimbatore
India
GSTIN : 33AADCE9083H1ZJ

TAX INVOICE

Invoice Number	ETS/21-22/0305	Place of Supply	Tamil Nadu
Invoice Date	25-08-2021	Kind Attention	Kamaraj College of Engineering and Technology
Payment Terms	Immediate Payment	Mobile Number	(+91)4549 278171
Payment Due Date	25/Aug/2021	Email	mail@kamaraj.engg.edu.in
Customer Reference	Your phone call dated on 03.08.2021	Customer Comments	
E-Way Bill Number	[redacted]	Acknowledge Date	
		Acknowledge No	[redacted]

IRN Number

Bill To
Kamaraj College of Engineering and Technology
S.P.G.Chidambara nadar, C.Nagammal Campus
S.P.G.C. Nagar,K.Vellakulam
Virudhunagar, Tamil Nadu - 625701 India
(+91)4549 278171

Ship To
Kamaraj College of Engineering and Technology
S.P.G.Chidambara nadar, C.Nagammal Campus
S.P.G.C. Nagar,K.Vellakulam
Virudhunagar, Tamil Nadu - 625701 India
(+91)4549 278171

S #	ITEM & DESCRIPTION	HSN	QTY	UNIT PRICE	CGST RATE	CGST AMOUNT	SGST RATE	SGST AMOUNT	EXTENDED PRICE
1	Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology	999293	20	1,800.00	9.0 %	3240.00	9.0 %	3240.00	36,000.00
Totals			**20**	**1800.00 ₹**		**3240.00 ₹**		**3240.00 ₹**	**36000.00 ₹**

Items in Total : 20

Thanks for your business.

Sub Total	36,000.00 ₹
CGST	3240.00 ₹
SGST	3240.00 ₹
Total	42,480.00 ₹
Payment Made	(-) 0.00 ₹
Balance Due	[redacted]

Total In Words :Forty-Two Thousand, Four Hundred And Eighty Rupees only

Program Title: Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology
The Program Proposed by: Dr.R.Sureshbabu & Dr.T.Prathiba
Eligible Branch: BE
Maximum Strength: 20
Hands On Training Period: 6 days
Training Charges: Rs. 300 per student per day

Objective
- To introduce the fundamental architecture of Microcontrollers
- To Learn the interface of peripheral devices (Sensors/Actuators)
- To explore the integration between Microcontroller and with LoRa IoT platform
- Understand the concept of Wireless Communication Protocols for LoRa-IoT

Applications (Wi-Fi, Bluetooth, BLE)
- Understand the concept of MQTT, HTTP Protocols

Pre-requisite (Technical)
- Basic Knowledge of Microcontroller
- Basic Knowledge of C Programming

Topics to be covered in the Technology Training Period:
Day1
Session I
- Introduction to IoT
IoT Applications
IoT Architecture

For Enthu Technology Solutions India Pvt. Ltd.

Dr. K. Subramanian
Technical Lead
Enthu Technology Solutions India Private Limited
Coimbatore-04
Cell: 9944849058 | Email: subramanian@enthutec

VAC coordinator

HOD/ECE

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S.P.G.Chidambara Nadar - C.Nagammal Campus

S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR).

SECURE ACCESS AND MONITORING SYSTEM WITH LORAWAN INTEGRATION

A REPORT ON VALUE ADDED COURSE

Submitted By

S.BOOBALAN (Reg. No. 920421106006)

A.BALAJI (Reg. No. 920421106005)

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

KAMARAJ COLLEGE OF ENGINEERING AND TECHNOLOGY

K.VELLAKULLAM-625 701,NEAR VIRUDHUNAGAR,TAMIL NADU

AUGUST 2023

ACKNOWLEDGEMENT

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BOOBALAN.S

BALAJI.A

VAC coordinator

HOD/ECE

ABSTRACT

A security mechanism is needed to ensure enhanced access control and real-time monitoring in restricted environments, safeguarding valuable assets and providing a seamless and user-friendly experience for users.

This project introduces an innovative security system featuring a dynamic access control mechanism, combining ultrasonic and infrared (IR) sensors with LoRaWAN communication. The integrated LoRaWAN technology enables seamless connectivity with The Things Network (TTN), enabling real-time communication between the security system and the cloud-based TTN platform. Custom messages are transmitted based on the user's actions, such as box openings, closures, and person presence.

This advanced security system offers an intelligent, secure, and user-friendly solution for diverse applications, including secure access control, restricted environments, and personalized item storage. The LoRaWAN integration empowers remote monitoring and efficient management, making it a robust choice for modern security solutions.

The incorporation of LoRaWAN allows for remote monitoring and efficient management, making it a solid choice for current security systems.

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CHAPTER 1
INTRODUCTION

In an era of rapid technological advancements, the need for robust security mechanisms and seamless connectivity has become increasingly paramount. As society embraces the digital age, the demand for innovative solutions that ensure enhanced access control, real-time monitoring, and secure communication in restricted environments has never been more pressing. The convergence of cutting-edge technologies has paved the way for the creation of sophisticated systems that not only safeguard valuable assets but also provide a seamless and user-friendly experience for individuals interacting with them.

This project sets out to address these challenges by introducing an innovative and comprehensive solution: the Secure Access and Monitoring System with LoRaWAN Integration. This advanced system represents a significant leap forward in the realm of security and connectivity, merging state-of-the-art hardware components with LoRaWAN communication technology to create a versatile and intelligent ecosystem.

1.1 Objectives

The primary objective of this project is to design and implement a Secure Access and Monitoring System that capitalizes on LoRaWAN technology to enable seamless connectivity and communication between the system's components and a cloud-based platform. The project seeks to develop an end-to-end solution that integrates ultrasonic and infrared (IR) sensors to facilitate dynamic access control, real-time monitoring, and personalized item storage. By harnessing the power of LoRaWAN, the system aims to provide users with unprecedented levels of control, security, and insight into their environments.

1.2 Scope

The scope of this project encompasses the entire lifecycle of the Secure Access and Monitoring System, from design and hardware integration to software development and cloud-based communication. The project also entails the implementation of a graphical user interface (GUI) for users to interact with the system, providing a user-

friendly experience that caters to a wide range of applications.

1.3 Significance

The significance of this project lies in its potential to revolutionize security and monitoring paradigms. By seamlessly integrating ultrasonic and IR sensors with LoRaWAN communication, the system offers a multi-faceted solution that can be applied across diverse scenarios. This includes secure access control for restricted environments, personalized item storage with real-time updates, and comprehensive monitoring capabilities that extend beyond physical proximity. The integration of LoRaWAN ensures that users can remotely manage and monitor the system, offering peace of mind and actionable insights in various contexts.

CHAPTER 2
SYSTEM DESIGN

2.1 Proposed Methodology

The heart of the proposed system lies in its dynamic and intelligent access control mechanism. Combining technologies such as ultrasonic and infrared (IR) sensors with LoRaWAN communication, this system redefines security by offering an integrated solution that bridges the physical and digital realms. By seamlessly connecting to The Things Network (TTN), a cloud-based platform, the system ensures real-time communication and interaction.

2.2 Advantages of the Proposed Methodology

2.2.1 Enhanced Access Control

Traditional access control methods often fall short in providing a comprehensive solution. The proposed system addresses this limitation by offering a dynamic approach. It allows authorized individuals to gain access, while monitoring their actions and interactions within a restricted environment. This contributes to heightened security and accountability.

2.2.2 Real-time Monitoring

Real-time monitoring is a crucial aspect of modern security systems. The proposed system excels in this area by providing immediate updates and notifications. Whether it's detecting a door opening, an item being moved, or the presence of a person, the system relays this information in real-time, empowering users to take prompt actions.

2.2.3 LoRaWAN Integration

The integration of LoRaWAN technology is a game-changer. It enables the system to communicate over long distances with minimal power consumption. This means that even remote locations can be monitored and controlled effectively. The wireless nature of LoRaWAN eliminates the need for complex wiring, making installation and maintenance hassle-free.

2.2.4 Customizable Messaging

Every action has a consequence, and the proposed system ensures that the right people are informed. When a door is opened, a box is closed, or a person is detected, the system sends out customizable messages. This feature enables users to tailor notifications to their specific needs, ensuring that critical information reaches the right individuals.

2.3. BLOCK DIAGRAM

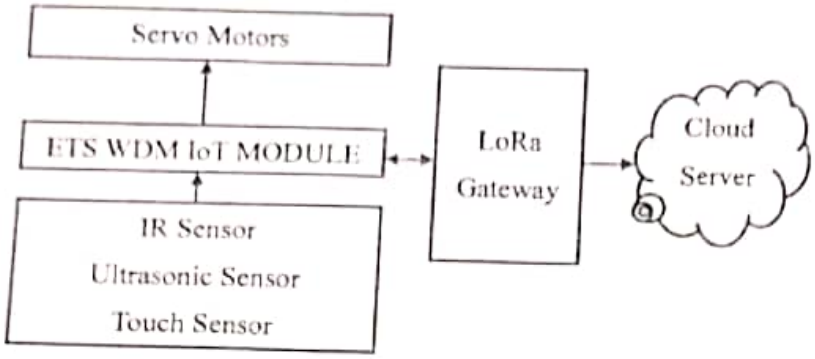


Figure 1.1: Block Diagram

This is the proposed system in which the ETS WDM IoT Module act as a microcontroller that receives data from end devices (sensors) like IR Sensor, Ultrasonic Sensor and Touch Sensor and controls the end devices (actuators) like Servo motors. This microcontroller transmits the data from end devices to the Network Server (TheThingsNetwork) via the LoRa gateway.

CHAPTER 3

TOOLS AND TECHNOLOGIES

3.1. HARDWARE TOOLS

In the development of our secure access and monitoring system with LoRaWAN integration, we utilized a set of hardware tools to build a robust and functional setup. These tools played a crucial role in implementing the various components of our system, ensuring its reliability and effectiveness. The key hardware tools used in our project include:

- Ultrasonic Sensor (HC-SR04)
- Touch Sensor (TTP223)
- IR Sensor
- Servo Motor
- WDS EDM IoT Board
- Dragino LPS8 LoRaWAN Gateway

3.1.1 Hardware Overview - Ultrasonic sensor (HC-SR04)

An ultrasonic sensor is a versatile electronic device that utilizes sound waves beyond the range of human hearing to detect objects, distances, and movements. This sensor works based on the principle of emitting ultrasonic pulses and measuring the time it takes for these pulses to bounce back after hitting an object. By calculating the time delay between emission and reception, the sensor can determine the distance to the object.

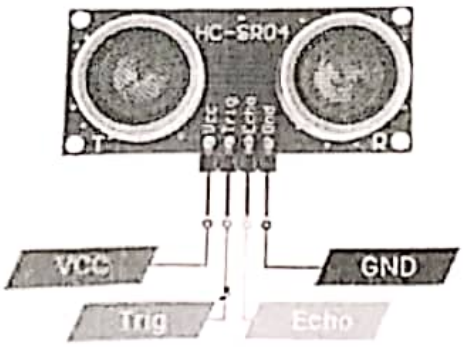


Figure 1.2: Ultrasonic Sensor

3.1.2 Hardware Overview - Touch sensor

The TTP223 is a touch sensor module that detects human touch on its surface. It offers a simple and reliable way to add touch sensing capabilities to various electronic projects. When a user touches the designated area on the sensor, it detects the touch and provides an output signal, indicating the touch event.

When a person touches the pad, the capacitance between the touch pad and the person's body changes. This change in capacitance is detected by the touch sensor. The touch sensor module quickly detects the change in capacitance and registers it as a touch event. It then generates a corresponding digital output signal, indicating that a touch has been detected. The digital output signal can be read by a microcontroller or other digital circuitry. This signal can be used to trigger various actions, such as turning on a light, activating a switch, or interfacing with a display.

Figure 1.3: Touch Sensor

3.1.3 Hardware Overview - IR Sensor

An IR sensor module that has both a receiver and a transmitter is commonly referred to as an "IR Proximity Sensor" or "IR Proximity Detector." This type of sensor module combines both the ability to emit infrared radiation (transmitter) and detect reflected or emitted IR radiation (receiver). IR proximity sensors are widely used for detecting the presence or absence of objects within a certain range, based on the reflection of IR signals. The working of the IR sensor module is very simple, it consists of two main components: the first is the IR transmitter section and the second is the IR receiver section. In the transmitter section, IR led is used and in the receiver section, a

photodiode is used to receive infrared signal and after some signal processing and conditioning, the output is obtained

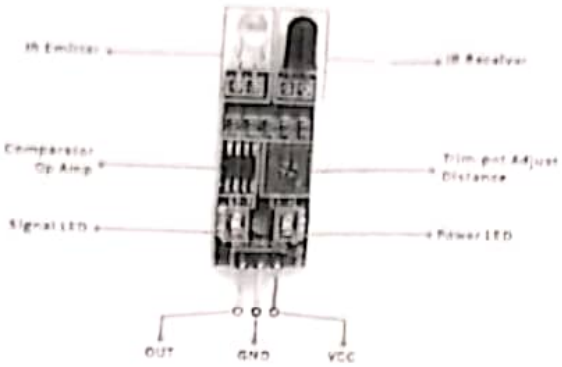


Figure 1.4: IR Sensor

3.1.4 Hardware Overview - Servo motor

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. It consists of three parts:

1. Controlled device
2. Output sensor
3. Feedback system

It is a closed-loop system where it uses a positive feedback system to control motion and the final position of the shaft. Here the device is controlled by a feedback signal generated by comparing output signal and reference input signal.

Here reference input signal is compared to the reference output signal and the third signal is produced by the feedback system. And this third signal acts as an input signal to the control the device. This signal is present as long as the feedback signal is generated or there is a difference between the reference input

signal and reference output signal. So the main task of servomechanism is to maintain the output of a system at the desired value at presence of noises.

3.1.5 Hardware Overview - WDS EDM IoT Board

3.1.5.1 Introduction

The EDS WDM IoT board, or Wireless Development Module, is a versatile hardware component designed to expedite the creation of Proof of Concept projects in a streamlined manner. It serves as a versatile platform that supports multiple wireless communication protocols, making it an ideal choice for various IoT applications. This IoT board empowers developers to easily interface with different sensors and communicate over various wireless technologies, such as LoRa, LoRaWAN, Wi-Fi, Bluetooth Classic, and Bluetooth Low Energy (BLE). Its compatibility with popular programming environments, coupled with its support for battery-powered operation, ensures flexibility and convenience in the development process.

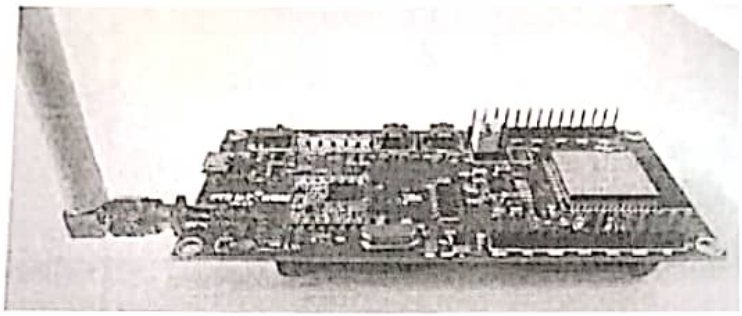


Figure 1.5: EDS WDM IoT Board

3.1.5.2 Specifications

- CPU: Xtensa dual-core 32-bit LX6 microprocessor, up to 240MHz
- ROM: 448KB for booting and core functions
- SRAM: 520KB for booting and instructions
- SRAM: 16 KB in RTC
- SPI Flash: 4MB
- Ultra-Low Power (ULP) Co-processor
- Crystal oscillator: 40 MHz

Digital I/O and Interfaces:

- 8x Hybrid Digital IO with Special Functions
- Special Functions: 1x I2C, 1x SPI, 1x UART
- 4x Hybrid Analog & Digital IO
- 2x Hybrid Analog & Digital IN

Analog Specifications:

- Analog Resolution: 8, 10, 12-bit configurable
- Pulse Width Modulation (PWM)
- Onboard Temperature Sensing (typ., -40°C to 90°C) with Accuracy 0.3°C
- Onboard Humidity Sensing (typ., 0%RH to 100%RH) with Accuracy 2%RH

Onboard Components:

- Onboard LED: 1x RED
- Onboard Antenna for Wi-Fi & Bluetooth
- Onboard Battery Recharge option
- Onboard SHT31 – Temperature and Humidity Sensor

Wireless Specifications (LoRa):

- LoRa Chip: RF96
- Data Rate: 300kbps
- Power Output: 20dBm
- Sensitivity: -148dBm
- Frequency Range: 865-867 MHz (Bands: IN865)
- Protocol: LoRa™
- Modulation: FSK, GFSK, GMSK, MSK, OOK
- Antenna Type: External Antenna via SMA / I-Pex connector

Wireless Specifications (Wi-Fi and Bluetooth):

- Wi-Fi: 802.11b/g/n, Bit rate up to 150 Mbps
- Bluetooth: Bluetooth v4.2 BR/EDR and BLE specification

Power and Battery:

- Supply Voltage: 5 V
- Operating Voltage: 3.0 - 3.6 V
- Battery Voltage: 3.7 V Li-Poly

- Option for Battery-Powered Operation (3.7V - 18650 rechargeable lithium Polymer battery) – Not Included in the Pack

Operating Conditions:

- Operating Temperature Range: – 40 °C ~ 85 °C

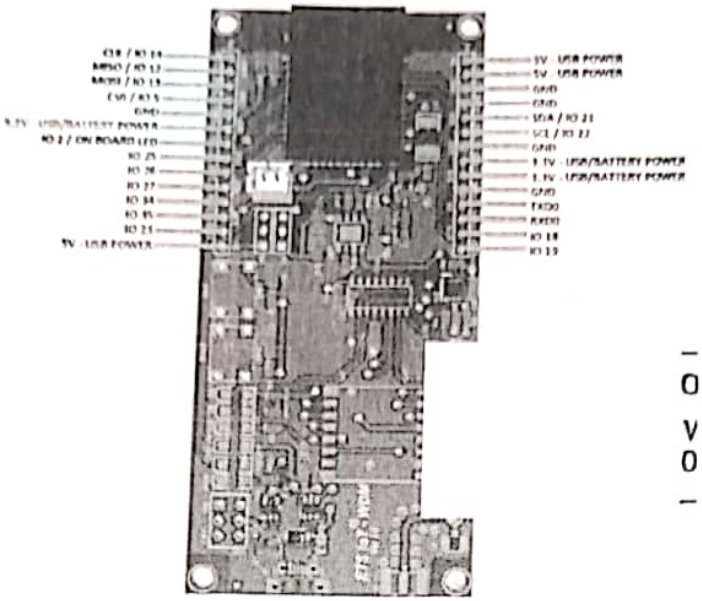


Figure 1.5: EDS WDM IoT Board - Pin Diagram

3.1.5.3 Interfacing EDS WDM IoT with Arduino

- Download LMIC Library from **https://www.arduinolibraries.info/libraries/mcci-lo-ra-wan-lmic-library**
- Extract the zip as a folder
- Go to *location .....\MCCI_LoRaWAN_LMIC_library-4.0.0\project_config* and open *lmic_project_config.h* and make changes as follows for Indian Frequency and save it.

```
// project-specific definitions
//#define CFG_eu868 1
//#define CFG_us915 1
//#define CFG_au915 1
//#define CFG_as923 1
// #define LMIC_COUNTRY_CODE LMIC_COUNTRY_CODE_JP    /* for as923-JP */
//#define CFG_kr920 1
#define CFG_in866 1
#define CFG_sx1276_radio 1
//#define LMIC_USE_INTERRUPTS
```

- Go to location ..... *\MCCI_LoRaWAN_LMIC_library-4.0.0\src\hal and open hal.cpp* and find below line

Before Change:

```
static void hal_spi_init () {
    SPI.begin();
}
```

Make changes in SPI.begin() as follows and save it

```
static void hal_spi_init () {
    SPI.begin(14,12,13,15);
}
```

Note: The Pin definition for SPI Pins were as follows CLK – 14, MISO – 12, MOSI – 13, NSS – 15

- Copy and paste this folder *MCCI_LoRaWAN_LMIC_library-4.0.0* in following location .... *\Documents\Arduino\libraries*

Pin No.	Pin Name	IO No.	Type	Function
1	CLK	14	I/O	GPIO, ADC, RTC, SPI_CLK, LoRa_SPI_CLK
2	MISO	12	I/O	GPIO, ADC, RTC, SPI_MISO, LoRa_SPI_MISO
3	MOSI	13	I/O	GPIO, ADC, RTC, SPI_MOSI, LoRa_SPI_MOSI
4	CS0	5	I/O	GPIO, SPI_CS0
5	GND	--	GND	GROUND
6	3V3	--	PWR	3.3V Power Supply while connecting Battery (or) USB
7	IO2	2	I/O	GPIO, ADC, RTC, On Board LED
8	IO25	25	I/O	GPIO, ADC, RTC
9	IO26	26	I/O	GPIO, ADC, RTC
10	IO27	27	I/O	GPIO, ADC, RTC
11	IO34	34	I	Input_Pin, ADC, RTC
12	IO35	35	I	Input_Pin, ADC, RTC
13	IO23	23	I/O	GPIO
14	5V	--	PWR	5V Power Supply while connecting USB Only
15	IO19	19	I/O	GPIO
16	IO18	18	I/O	GPIO
17	RXD0	3	I/O	GPIO, U0RXD
18	TXD0	1	I/O	GPIO, U0TXD
19	GND	--	GND	GROUND
20	3V3	--	PWR	3.3V Power Supply while connecting Battery (or) USB
21	3V3	--	PWR	3.3V Power Supply while connecting Battery (or) USB
22	GND	--	GND	GROUND
23	SCL	22	I/O	GPIO, I2C_SCL, Also Configured for Onboard SHT31 SCL
24	SDA	21	I/O	GPIO, I2C_SDA, Also Configured for Onboard SHT31 SDA
25	GND	--	GND	GROUND
26	GND	--	GND	GROUND
27	5V	--	PWR	5V Power Supply while connecting USB Only
28	5V	--	PWR	5V Power Supply while connecting USB Only

Figure 1.6: EDS WDM IoT Board - Pin Description

3.1.6 Hardware Overview - Dragino LPS8 LoRaWAN Gateway

3.1.6.1 Introduction

The LPS8 is an open source LoRaWAN Gateway. It lets you bridge LoRa wireless network to an IP network via WiFi, Ethernet. The LoRa wireless allows users to send data and reach extremely long ranges at low data-rates.

The LPS8 usesSemtech packet forwarder and fully compatible with LoRaWAN protocol. It includes a SX1308 LoRa concentrator, which provides10 programmable parallel de-modulation paths.

LPS8 has pre-configured standard LoRaWAN frequency bands to use for different countries. User can also customized the frequency bands to use in their own LoRa network.

Figure 1.7: LPS8 LoRaWAN Gateway

3.1.6.2 Specifications

Gateway Connectivity:

- Bridging: Connects LoRa wireless network to IP network via WiFi, Ethernet.
- Interface Options: WiFi, Ethernet.

LoRa Wireless Communication:

- Long Range: Enables data transmission over extended distances.
- Low Data Rates: Supports communication at low data rates.
- Frequency Range: Suitable for operating in the 865-867 MHz frequency range.
- Protocol: LoRaWAN 1.0.3 Class A.
- Activation Methods: Supports both ABP (Activation By Personalization) and OTAA (Over-The-Air Activation).

Power Consumption:

- Low Power Design: Designed for energy efficiency.

Physical Attributes:

- Antenna Compatibility: External Antenna via SMA / I-Pex connector.
- Dimensions: Standard form factor.
- Operating Temperature Range: -20°C to 70°C.

Compatibility and Integrations:

- Open Source Software: Supports open source software.
- Arduino Programmable: Programmable using Arduino platform.
- LMIC Library Compatible: Compatible with the LMIC library for LoRaWAN protocol.

Common DC Characteristics:

- Supply Voltage: 5V.
- Operating Voltage: 3.0V - 3.6V.
- Minimum Current Delivered by Power Supply: 500mA.
- Battery Voltage: 3.7V Li-Poly.

Gateway Functionality:

- Gateway Role: Acts as a LoRaWAN gateway.
- Data Handling: Facilitates data transmission and reception between LoRa nodes and IP network.
- IoT Enablement: Enables integration with Internet of Things (IoT) applications.
- Coverage Enhancement: Extends network coverage for connected devices.

Network Features:

- Bridging LoRa and IP Networks: Provides a bridge between LoRa wireless network and IP network.
- IP Network Connectivity: Enables devices to communicate over IP networks.

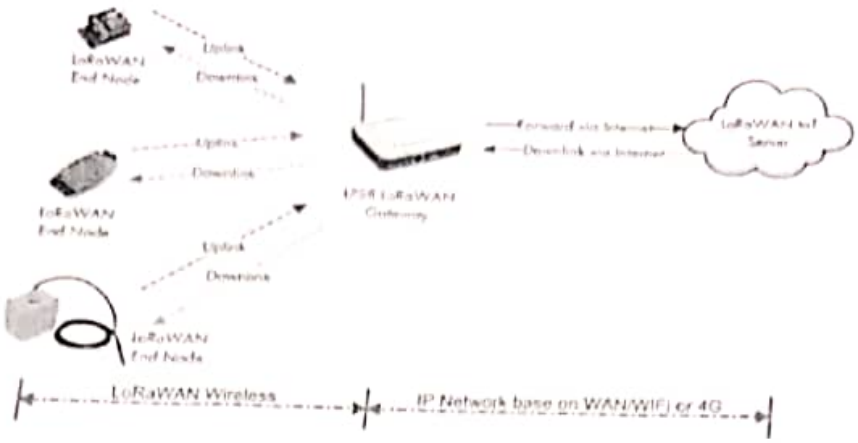


Figure 1.8: LPS8 in LoRaWAN Network

3.2. SOFTWARE TOOLS

The software tools utilized in the project provide a foundation for development, communication, and data management. These tools are selected to align with the project's goals and requirements.

3.2.1 Arduino IDE

Arduino IDE, a user-friendly integrated development environment, forms the core of software development. Its simplicity and versatility make it an ideal platform for coding the EDS WDM board, enabling seamless integration of sensors and data processing.

3.2.2 The Things Network (TTN)

The Things Network, a cloud-based LoRaWAN platform, serves as the linchpin for secure communication between the sensor nodes and the central system. It enables seamless transmission of data over long distances while maintaining data privacy and integrity.

3.2.3 Windows PC

A Windows PC serves as the command center for the system, facilitating user interaction, data analysis, and configuration. Its familiar interface and broad compatibility ensure smooth system management and monitoring.

In conclusion, the selection of appropriate hardware and software tools is pivotal in ensuring the successful implementation of the Secure Access and Monitoring System with LoRaWAN Integration. These tools collectively contribute to the system's reliability, functionality, and effectiveness, forming the foundation for its development and operation.

CHAPTER 4

CODE

```
#include <lmic.h>
#include <hal/hal.h>
#include <SPI.h>
#include <ESP32_Servo.h>
#define LED 2
Servo servo1;
Servo servo2;
int t,p;
int person,box,door,touchh,alert;
const int ir = 25;
const int angleZero = 0;
const int angleOpen = 90;
const int angleZero2=0;
const int angleOpen2=90;
const int pingPin = 23; // Trigger Pin of Ultrasonic Sensor
const int echoPin = 27; // Echo Pin of Ultrasonic Sensor
const int touchs=34;
bool person=false;
bool personin=false;
bool boxOpen=false;
int irs;
bool doorOpen = false;
void irdoor();
void ultras();
void touch();
void final();
```

The code includes necessary libraries for LoRaWAN communication (lmic.h, hal/hal.h), SPI communication (SPI.h), and servo motor control (ESP32_Servo.h).

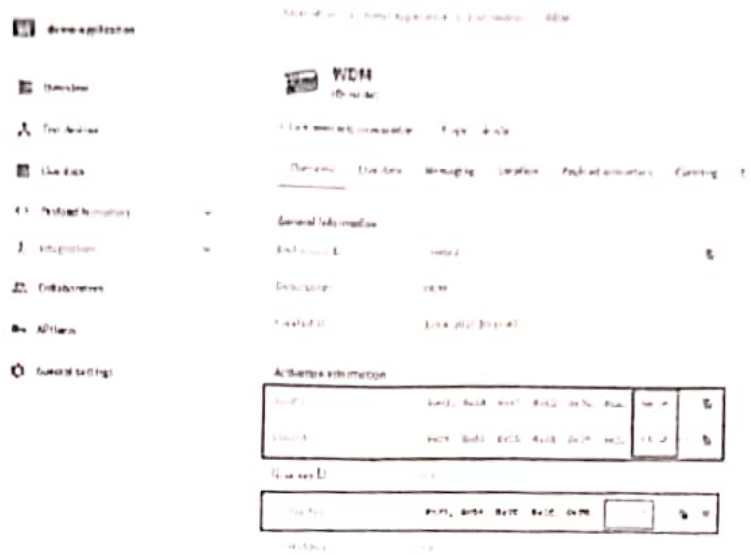
```
// LoRaWAN NwkSKey, network session key
static const u1_t PROGMEM APPEUI[8]={ 0xFA, 0xFA, 0x2A, 0x43, 0x42, 0x53, 0x46, 0x25 };
void os_getArtEui (u1_t* buf) { memcpy_P(buf, APPEUI, 8);}
// LoRaWAN AppSKey, application session key
// This is the default Semtech key, which is used by the early prototype TTN
// network.
static const u1_t PROGMEM DEVEUI[8]= { 0x0F, 0x4F, 0x84, 0x00, 0x7F, 0x05, 0x83, 0x70 };
void os_getDevEui (u1_t* buf) { memcpy_P(buf, DEVEUI, 8);}

// LoRaWAN end-device address (DevAddr)
static const u1_t PROGMEM APPKEY[16] = { 0x7C, 0x3F, 0x68, 0xCE, 0x81, 0x85, 0xE1, 0x00, 0xF3, 0xFE, 0x0F, 0xCD, 0x58, 0xE5, 0x80, 0x64 };
void os_getDevkey (u1_t* buf) { memcpy_P(buf, APPKEY, 16);}
```

4.1 Security Key:

- The APPEUI constant is defined with an 8-byte array containing hexadecimal values. This array seems to represent the **Application EUI** (Extended Unique Identifier) for LoRaWAN. The values are used to uniquely identify the application within the LoRaWAN network.
- The os_getArtEui function is defined. It takes a pointer to an u1_t (unsigned 8-bit) array as an argument. Inside the function, the memcpy_P function is used to copy the values from the APPEUI constant stored in program memory (PROGMEM) to the provided buffer. This function is likely used by the LMIC (LoRaWAN MAC in C) library to retrieve the Application EUI during network initialization.
- The DEVEUI constant is defined with an 8-byte array, representing the **Device EUI** for LoRaWAN. Similar to the Application EUI, the Device EUI uniquely identifies the device within the LoRaWAN network.
- The os_getDevEui function is defined, which serves a purpose similar to the os_getArtEui function. It copies the values from the DEVEUI constant to the provided buffer.
- The APPKEY constant is defined with a 16-byte array containing hexadecimal values. This array represents the **Application Key**, which is used for encryption and decryption of data between the end-device and the network server.
- The os_getDevKey function is defined to retrieve the Device Key. Similar to the other functions, it uses the memcpy_P function to copy the values from the APPKEY constant to the provided buffer.

These constants and functions are essential for configuring the LoRaWAN network settings and security keys, which are crucial for establishing communication between the end-device and the LoRaWAN network server. The LMIC library uses these functions to access the necessary keys during network initialization and data transmission.

These keys must be copied from the TTI V3 Devices Page and replace them in the code in the format such that while copying AppEUI, DevEUI & AppKey the keys must be in the Position (MSB / LSB) as highlighted in following image.



In The Things Network (TTN), the "Decoder" tab is a significant feature within the TTN Console that allows you to define custom JavaScript functions for decoding raw binary data received from devices into human-readable formats. This tab is a part of the TTN Console's integrated Payload Formats feature, which enables you to transform and interpret the data sent by your devices over the LoRaWAN network.

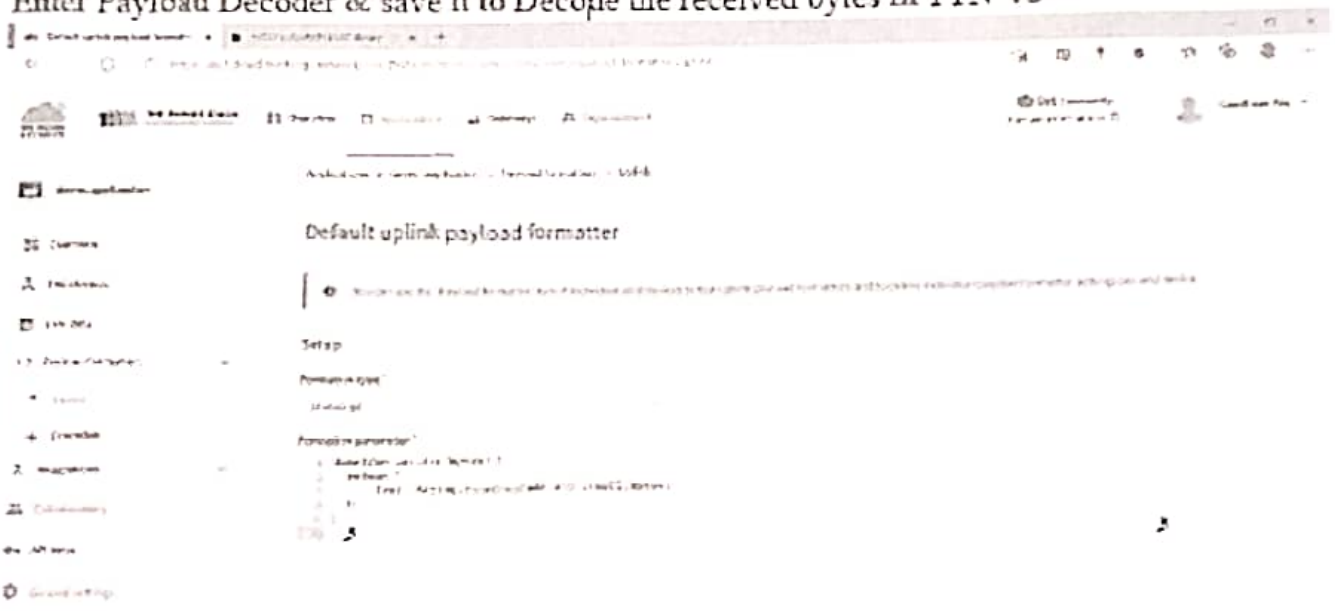
Comment following lines to disable European Frequency

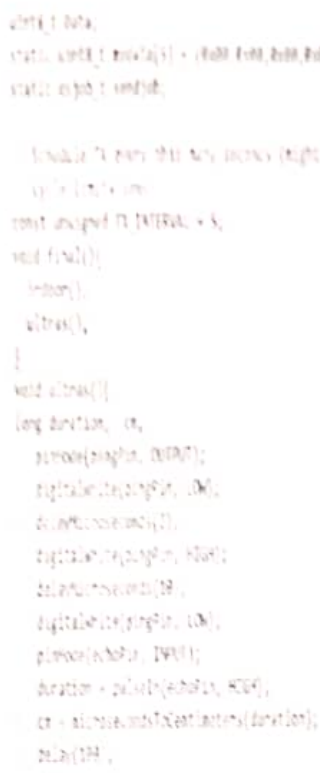
```
#if defined(CFG_eu868)
// Set up the channels used by the Things Network, which corresponds
// to the defaults of most gateways. Without this, only three base
// channels from the LoRaWAN specification are used, which certainly
// works, so it is good for debugging, but can overload those
// frequencies, so be sure to configure the full frequency range of
// your network here (unless your network autoconfigures them).
// Setting up channels should happen after LMIC_setSession, as that
// configures the minimal channel set. The LMIC doesn't let you change
// the three basic settings, but we show them here.
//LMIC_setupChannel(0, 868100000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(1, 868300000, DR_RANGE_MAP(DR_SF12, DR_SF7B), BAND_CENTI);      // g-band
//LMIC_setupChannel(2, 868500000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(3, 867100000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(4, 867300000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(5, 867500000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(6, 867700000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(7, 867900000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_CENTI);      // g-band
//LMIC_setupChannel(8, 868800000, DR_RANGE_MAP(DR_FSK,  DR_FSK),  BAND_MILLI);      // g2-band
// TTN defines an additional channel at 869.525Mhz using SF9 for class B
// devices' ping slots. LMIC does not have an easy way to define set this
// frequency and support for class B is spotty and untested, so this
```

Uncomment Following lines to enable Indian Frequency

```
// ... extra definitions for channels 3..n here.
#elif defined(CFG_in866)
// Set up the channels used in your country. Three are defined by default,
// and they cannot be changed. Duty cycle doesn't matter, but is conventionally
// BAND_MILLI.
LMIC_setupChannel(0, 865062500, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_MILLI);
LMIC_setupChannel(1, 865402500, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_MILLI);
LMIC_setupChannel(2, 865985000, DR_RANGE_MAP(DR_SF12, DR_SF7),  BAND_MILLI);
```

Enter Payload Decoder & save it to Decode the received bytes in TTN V3





static uint8_t mydata[5] = {0x00,0x00,0x00,0x00,0x00};: This line declares an array named mydata that holds 5 elements of type uint8_t. Each element is initialized with the hexadecimal value 0x00, which corresponds to the decimal value 0. This array is likely intended to store data that will be sent over a communication channel.
The mydata array holds data that will likely be transmitted, and the sendjob variable is likely used to schedule when the data transmission should occur.

The line const unsigned TX_INTERVAL = 5; defines a constant variable named TX_INTERVAL and initializes it with the value 5. The purpose of this constant is to determine the time interval (in seconds) between consecutive data transmissions. In this case, the value 5 suggests that data transmissions will be scheduled to occur every 5 seconds.

```
}
void touch()
{
int cm;
  do{
  cm=ult();
  t=digitalRead(touchk);
  if(t){
  p=p+1;
  delay(1000);
  person1=true;
}}while(p<7 && t==1 && cm<30);
  cm=ult();
if(p==7 && !boxOpen && t==1 && cm<30){
  openDoor();
  boxOpen=true;
  Serial.println("1 person near::Box opening with touch");
```

The *ultras()* function manages the behavior of the ultrasonic sensor, calculates the distance to an object, and interacts with the system's state. It triggers the touch() function when an object is close enough to trigger the touch sensor. Additionally, it handles closing the box's door and updating the state when the distance indicates that a person is not near the system.

The *touch()* function manages the behavior of the touch sensor and its interaction with the state of the system, determining whether to open or close the box's door based on the touch sensor input and proximity of a person. It updates status variables and mydata array to reflect the system's state.

```
    door=1;
     mydata[0]=door;
    mydata[1]=person;
    mydata[2]=box;
    mydata[3]=touch;
    mydata[4]=alert;
  }
  else if(cm>30 && cm<300)
  {if(boxOpen)
  {closeDoor();
  boxOpen=false;
  Serial.println("1 person away:::Box closing without touch");
  person=1;
  box=0;
  touchh=0;
  alert=0;
  door=1;
    mydata[0]=door;
    mydata[1]=person;
    mydata[2]=box;
    mydata[3]=touch;
    mydata[4]=alert;}
  p=0;}
   else if(cm<30 && p>0 && p<7)
   {p=0;
    Serial.println("Incorrect");
   }
   else if(cm <30 && p>7 && t==0){
     Serial.println("Processing");
     p=7;
```

```
void irdoor(){
  irs = digitalRead(ir);
  int cm=ultr();
  if (irs == HIGH && !doorOpen)
  {
    person=0;
    door=0;
    box=0;
    touchh=0;
    alert=0;
     mydata[0]=door;
 mydata[1]=person;
 mydata[2]=box;
 mydata[3]=touch;
 mydata[4]=alert;
 delay(100);}
 else if(irs == LOW && !doorOpen && cm>300)
 {openDoor();
 doorOpen=true;
 Serial.println("1 person in:::away from box:::box close:::door open");
  personin=true;
  person=1;
  touchh=0;
  box=0;
  door=1;
   mydata[0]=door;
mydata[1]=person;
mydata[2]=box;
mydata[3]=touch;
mydata[4]=alert;
```

The *irdoor()* function manages the behavior of the IR sensor with respect to the system's door state. It responds to different combinations of sensor readings and door conditions to determine if the door should be opened, closed, or if an alert condition should be raised due to too many persons near the door.

```
  delay(100);}
  else if(irs == HIGH && doorOpen && cm>300)
  {delay(100);}
  else if(irs == LOW && doorOpen && cm<300)
  {
     Serial.println("ALERT:::TOO MANY PERSONS");
     alert=1;
     person=1;
     box=0;
     door=1;
     touchh=0;
       mydata[0]=door;
  mydata[1]=person;
  mydata[2]=box;
  mydata[3]=touch;
  mydata[4]=alert;
  delay(100);}
else if(irs == LOW && doorOpen && cm>300)
  {closeDoor();
  doorOpen=false;
   if(!boxOpen){
     Serial.println("0 person in:::away from box:::box close:::door close");
     person=0;
     box=0;
     door=0;
     touch=0;
     alert=0;
      mydata[0]=door;
 mydata[1]=person;
 mydata[2]=box;

   mydata[3]=touch;
   mydata[4]=alert;}
   delay(100);}

}

void openDoor() {
  servo1.write(angleOpen);
  delay(1000); }

void open2Door() {
  servo2.write(angleOpen);
  delay(1000); }

void closeDoor() {
  servo1.write(angleZero);
  delay(1000); }

void close2Door() {
  servo2.write(angleZero);
  delay(1000); }

long microsecondsToCentimeters(long microseconds) {
  return microseconds / 29 / 2;
}

int ultr(){
long duration,  cm;
  pinMode(pingPin, OUTPUT);
```

opendoor(): This function controls the servo motor to open the main door. It sets the servo's position to the angle associated with the "open" state (e.g., angleOpen). This allows the door to be physically opened by turning the servo motor to a specific angle, creating an opening for access.

closedoor(): This function is used to close the main door. Similar to opendoor(), it sets the servo's position to the angle associated with the "closed" state (e.g., angleZero). This action closes the door by adjusting the servo motor to a specific angle that corresponds to a closed position.

open2door(): This function controls another servo motor to open a secondary door or box lid. It is similar in purpose to opendoor() but is designed for a different door or lid. It sets the servo's position to the angle associated with the "open" state for the secondary door.

close2door(): Similar to open2door(), this function is responsible for closing the secondary door or box lid. It sets the servo's position to the angle associated with the "closed" state for the secondary door, effectively closing it.

```
    digitalWrite(pingPin, LOW);
    delayMicroseconds(2);
    digitalWrite(pingPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(pingPin, LOW);
    pinMode(echoPin, INPUT);
    duration = pulseIn(echoPin, HIGH);
    cm = microsecondsToCentimeters(duration);
  delay(100);
  return cm;}

// Pin mapping
const lmic_pinmap lmic_pins = {
    .nss = 15,
    .rxtx = LMIC_UNUSED_PIN,
    .rst = 17,
    .dio = {4, 33, 32},
};

void onEvent (ev_t ev) {
    Serial.print(os_getTime());
    Serial.print(": ");
    switch(ev) {
        case EV_SCAN_TIMEOUT:
            Serial.println(F("EV_SCAN_TIMEOUT"));
            break;
        case EV_BEACON_FOUND:
            Serial.println(F("EV_BEACON_FOUND"));
            break;
        case EV_BEACON_MISSED:
            Serial.println(F("EV_BEACON_MISSED"));
```

The *lmic_pins* structure represents:

- *.nss*: This stands for "not slave select" and refers to the pin that is used as the chip select (CS) or slave select (SS) pin for the SPI communication with the LoRa module. In this case, pin 15 is used for this purpose.
- *.rxtx*: This indicates the pin that can be used for controlling the radio's transmit/receive mode. LMIC_UNUSED_PIN suggests that this pin is not being used in your configuration.

- *.rst*: This represents the pin used for resetting the LoRa module. Pin 17 is designated for this purpose, and it can be toggled to reset the module if needed.
- *.dio*: This array specifies the pins used for digital input and output (DIO) functions associated with the LoRa module. These pins are often used to handle interrupt signals and various events from the module. In your case, pins 4, 33, and 32 are assigned to DIO0, DIO1, and DIO2 respectively.

```
        break;
    case EV_BEACON_TRACKED:
        Serial.println(F("EV_BEACON_TRACKED"));
        break;
    case EV_JOINING:
        Serial.println(F("EV_JOINING"));
        break;
    case EV_JOINED:
        Serial.println(F("EV_JOINED"));
        break;
    case EV_RFU1:
        Serial.println(F("EV_RFU1"));
        break;
    case EV_JOIN_FAILED:
        Serial.println(F("EV_JOIN_FAILED"));
        break;
    case EV_REJOIN_FAILED:
        Serial.println(F("EV_REJOIN_FAILED"));
        break;
    case EV_TXCOMPLETE:
        Serial.println(F("EV_TXCOMPLETE (includes waiting for RX Windows)"));
        if (LMIC.txrxFlags & TXRX_ACK)
          Serial.println(F("Received ack"));
        if (LMIC.dataLen) {
          Serial.println(F("Received "));
          for (int i = 0; i < LMIC.dataLen; i++)
          {
            if (LMIC.frame[LMIC.dataBeg + i] < 0x10)
            {
              Data = (LMIC.frame[LMIC.dataBeg + i]);
```

```
            Serial.println(F("EV_LINK_ALIVE"));
            break;
        default:
            Serial.println(F("Unknown event"));
            break;
    }
}

void do_send(osjob_t* j){
    // Check if there is not a current TX/RX job running
    if (LMIC.opmode & OP_TXRXPEND)
    {
        Serial.println(F("OP_TXRXPEND, not sending"));
    }
    else
    {
        final();
        // Prepare upstream data transmission at the next possible time.
        LMIC_setTxData2(1, mydata, sizeof(mydata), 0);
        Serial.println(F("Packet queued"));
    }
    // Next TX is scheduled after TX_COMPLETE event.
}

void setup() {
    //analogReference(INTERNAL);
    Serial.begin(9600);
 servo1.attach(18);
 servo2.attach(19);
 pinMode(ir, INPUT);
 servo1.write(angleZero);
```

4.2 Event Handler (void onEvent(ev_t ev)):

This function is a callback that gets triggered when specific events occur during LoRaWAN communication. It prints out a description of the event and performs certain actions based on the event type. Some notable event cases include:

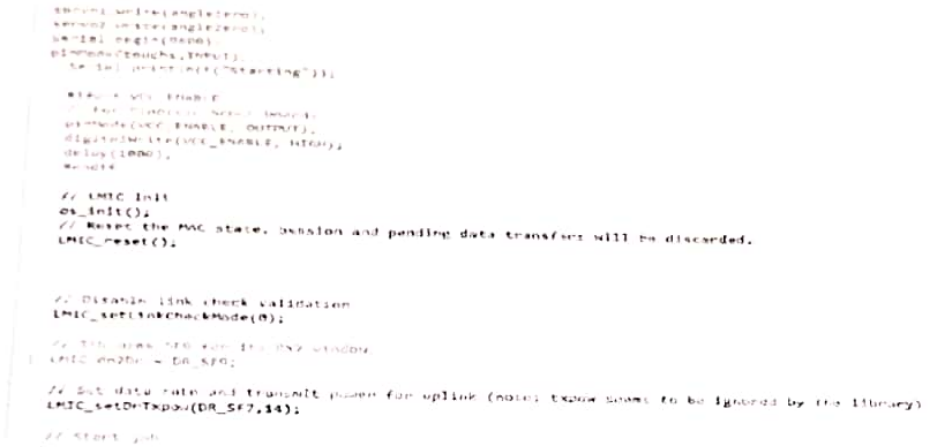
- EV_JOINING: The device is attempting to join the network.
- EV_JOINED: The device has successfully joined the network.
- EV_TXCOMPLETE: A transmission has been completed, and this event is triggered when both uplink and downlink operations have finished.
- EV_RXCOMPLETE: Data has been received during a ping slot.
- EV_LOST_TSYNC: Time synchronization with the network has been lost.
- EV_LINK_DEAD and EV_LINK_ALIVE: Indicating the network link status.

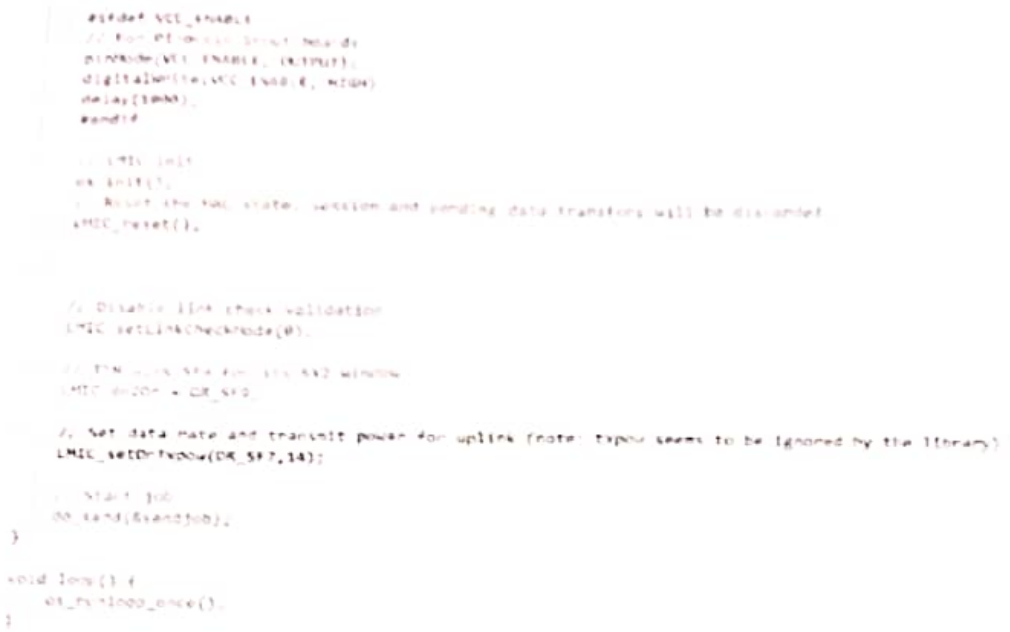
The code also handles specific cases, like printing received data and managing the LI based on received data.

4.3 Data Transmission (void do_send(osjob_t* j)):

This function handles the process of sending data to the LoRaWAN network. It checks whether there is an ongoing transmission or reception operation (indicated by LMIC.opmode & OP_TXRXPEND). If no ongoing operation is detected, it calls the final() function, which seems to be responsible for collecting sensor data. Then, it uses LMIC_setTxData2() to prepare the data for transmission. This function schedules the transmission to occur at the next available time.

These functions collectively manage the LoRaWAN communication, including event handling, data transmission, and scheduling of transmissions. The event handler provides insights into the state and progress of the LoRaWAN device within the network, and the data transmission function ensures that data is sent reliably and efficiently according to LoRaWAN specifications.





4.4 Setup Function (void setup()):

- It initializes the serial communication at a baud rate of 9600 for debugging and communication purposes.
- It sets up two servo motors (servo1 and servo2) attached to pins 18 and 19 respectively, which are presumably used for controlling mechanical movements.
- It configures an IR sensor connected to a pin named ir as an input pin.
- It sets the initial positions of the servo motors using the angleZero constant.
- It initializes serial communication again (this seems to be redundant and may not be necessary).
- It configures a touch sensor connected to a pin named touchs as an input pin.
- It prints "Starting" to the serial monitor.
- It checks if a macro VCC_ENABLE is defined. If it is defined, it sets up a pin (VCC_ENABLE) as an output and sets it to HIGH, possibly enabling power for specific hardware (e.g., Pinoccio Scout boards).
- It initializes the LMIC library by calling os_init() to prepare for LoRaWAN communication.
- It resets the MAC state and clears any session or pending data transfers using LMIC_reset().

- It disables link check validation, allowing for more flexible communication using LMIC_setLinkCheckMode(0).
- It sets the data rate for the downlink RX2 window to SF9 (Spreading Factor 9) for compatibility with The Things Network (TTN).
- It sets the data rate and transmit power for uplink using LMIC_setDrTxpow(DR_SF7, 14) where DR_SF7 represents Spreading Factor 7 and 14 represents the transmit power.
- Finally, it starts the job of sending data by calling the do_send(&sendjob) function.

4.5 Loop Function (void loop()):

The loop() function is used to continually run the LMIC library's run loop using os_runloop_once(). This function keeps the LoRaWAN device operational and responsive to events and transmissions.

In essence, the setup() function sets up various hardware components, initializes the LMIC library, and schedules the initial data transmission. The loop() function ensures that the LoRaWAN device continues to process events and maintain communication with the network.

CHAPTER 5
RESULT AND DISCUSSION

5.1 HARDWARE DESCRIPTION

The analog output from Ultrasonic Sensor and the digital output from IR Sensor are passed to the microcontroller and processed. Based on the program, the actuators (Servo Motors) are activated and the state of the sensors and actuators are sent to The Cloud through LoRaWAN Gateway.

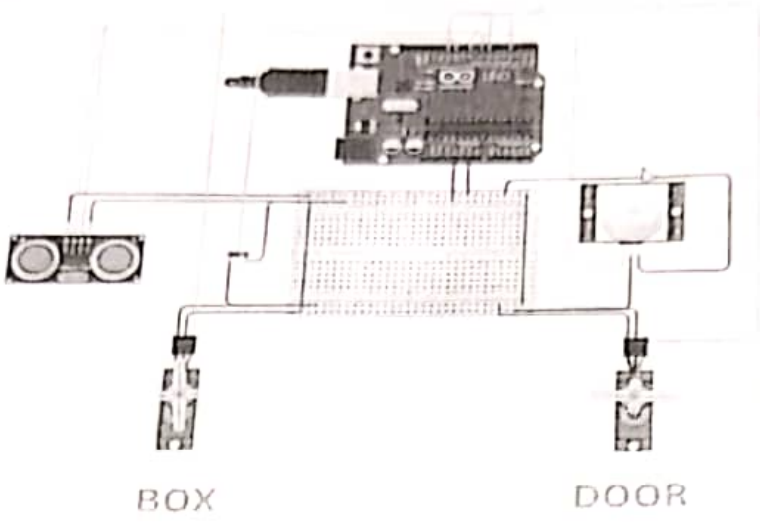


Figure 1.9: Hardware connection

5.2 WORKING PRINCIPLE

In this section, we will walk through a typical scenario that demonstrates the working principle of the **"Secure Access and Monitoring System with LoRaWAN Integration".** The scenario involves unlocking and locking a security box containing valuable items. The system's components and their interactions during this scenario are detailed below:

Initial State:

- The security box is locked, and the door is closed.

- The system is actively monitoring for any changes in the environment, including the presence of people and the status of the door.

Opening the Door:

- If a person crosses the IR sensor placed infront of the Door, the sytem checks the status of the Door and the Box.
- If the Door is closed, the Door opens and the system sends a LoRaWAN message indicating the status of the Door, the Box and the number of persons entering through the Door.

Unlocking the Box:

- If a person approaches the box, the ultrasonic sensor detects their presence.
- The ultrasonic sensor reads the distance between the person and the box. If he is within the range of 30 cm, the system enables the touch sensor. It means that the touch sensor works only if the person is within the range of 30 cm.
- Once the person is within the range of 30 cm, the touch sensors gets enabled and the person must place his/her finger on touch sensor for 7 seconds to unlock the Box.
- If the person withdraws within 7 seconds there would be a LoRaWAN message sent by the system indicating 'Error'.
- The touch sensor goes to reset stage. The person has to place his/her finger for another 7 seconds to unlock the Box.
- Once the person touches the touch sensor for complete 7 seconds, the system checks whether the box is already open. If it's closed, the system will open the box.
- The servo controlling the box's lid rotates to an open position (angleOpen) using the open2Door() function.
- The system sends a LoRaWAN message indicating that the box has been opened, and the status of the box and door are updated accordingly.
- The box is now unlocked and open, allowing access to its contents.
- The box remains open only if the person is within the range of 30 cm.
- If the person moves beyond 30 cm, the Box closes automatically and the status of the box and door are updated.

Accessing the Contents:

- With the box open, the person can now access the contents inside.

- The system keeps monitoring for any changes, including whether the person tries to remove the contents or closes the box.
- LoRaWAN messages are sent at periodic intervals as 'Processing' while the contents are being accessed.

Locking the Box:

- Once the person is done accessing the contents and to close the box, the person has to touch the sensor for another 7 seconds.
- After complete 7 seconds of contact, the system checks if the box was open.
- If the box was open, the system will close the box by rotating the servo back to its closed position (angleZero) using the close2Door() function.
- The system sends another LoRaWAN message indicating that the box has been closed and locked.
- The box is now locked, and its contents are secure.

Exiting the Area:

- If the person moves away from the box and the ultrasonic sensor detects their absence, the system will take note of this.
- Once the person moves beyond a certain range from ultrasonic sensor, the door opens and the door closes if the person crosses the infrared sensor placed near the door.
- If the box is locked and the door is closed, the system doesn't need to take any further action. It will continue monitoring.

Alerting for Unusual Activity:

- If the infrared sensor detects multiple people near the door while it's open, the system will trigger an alert.
- The system sets the "alert" variable to 1 and sends a LoRaWAN message indicating an alert condition.
- The system may also implement additional measures, such as flashing an LED to signal an alert to the user.
- If a person is within the range of ultrasonic sensor and if another person crosses ir sensor, the door does not open and a similar alert along with LED flashing signal is sent to the control user.

Sending Data and Communication:

- The system regularly sends updates over LoRaWAN to report the status of the door, box, presence of a person, and any alerts.
- These updates are handled by the do_send() function and are transmitted at specified intervals (TX_INTERVAL).
- For this system, the updates are sent for every 5 seconds.

CHAPTER 6

CONCLUSION

In conclusion, the presented security system utilizing an ESP32, ultrasonic, infrared, and LoRaWAN technology showcases a practical implementation of IoT for asset protection. The system effectively monitors and controls access to a secured box, demonstrating the synergy of hardware components and wireless communication. With the ability to detect and respond to user presence, along with LoRaWAN connectivity, the project lays a foundation for scalable and secure IoT applications. Ongoing testing, documentation, and potential enhancements ensure a reliable and adaptable solution for real-world security challenges.

CHAPTER 7

REFERENCE

1.https://scholar.google.co.in/scholar_url?url=https://www.mdpi.com/1424-8220/18/11/3995/pdf&hl=en&sa=X&ei=K8laZeCyIL.Ok6rQP4Yqw6A8&scisig=AFWwnc7KQSx-iBz5_r6wAWifLbEV&oi=scholarr

2.Listianihttps://www.researchgate.net/publication/320898475_IoT_devices_and_applications_based_on_LoRaLoRaWAN.

3.https://www.sciencedirect.com/science/article/pii/S2542660522000427 4. Kuiper, S. 2008. "Introduction to Multiple Regression: How Much Is Your Car Worth?", Journal of Statistics Education, 16(3).

4.https://www.trendmicro.com/vinfo/us/security/definition/lorawan#:~:text=LoRaWAN%20is%20a%20low%2Dpower,node%20devices%20and%20network%20gateways.

KAMARAJ

COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous Institution

LORAWAN BASED SECURITY MECHANISM

BY:

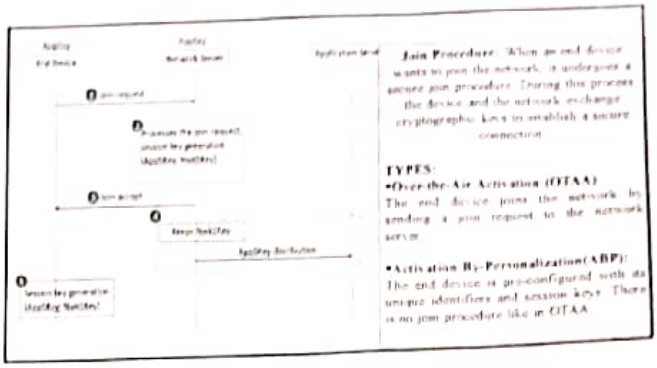
S.BOOBALAN(21UEC025)
A.BALAJI(21UEC011)

INTRODUCTION

LoRaWAN, or Long Range Wide Area Network, is a wireless communication protocol designed for connecting low-power, battery-operated devices to the internet using **chirp Spread Spectrum (CSS) and Core modulation technique**

LoRaWAN networks and devices through The Things Network (TTN) using a star-of-stars network. The central network server processes the data and forwards it to the respective application servers. Application servers can be hosted on the cloud or locally and are responsible for processing and storing the data sent by the end devices. Gateway nodes act as transparent bridges and relay messages between end devices and a central network server. They receive data from end devices and forward it to the network server. Gateways are typically connected to the internet via Ethernet, Wi-Fi, or cellular networks.

TABLE OF CONTENT



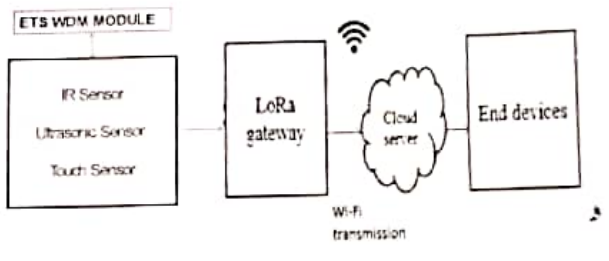
ABSTRACT

A security mechanism is needed to ensure enhanced access control and real-time monitoring in restricted environments, safeguarding valuable assets and providing a seamless and user-friendly experience for users.

This project introduces an innovative security system featuring a dynamic access control mechanism, combining ultrasonic and infrared (IR) sensors with LoRaWAN communication. The integrated LoRaWAN technology enables seamless connectivity with The Things Network (TTN), enabling real-time communication between the security system and the cloud-based TTN platform. Custom messages are transmitted based on the user's actions, such as box openings, closures, and person presence.

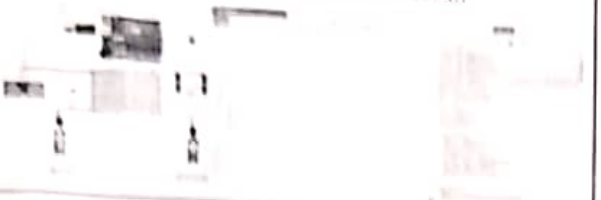
This advanced security system offers an intelligent, secure, and user-friendly solution for diverse applications, including secure access control, restricted environments, and personalized item storage. The LoRaWAN integration empowers remote monitoring and efficient management, making it a robust choice for modern security solutions.

BLOCK DIAGRAM

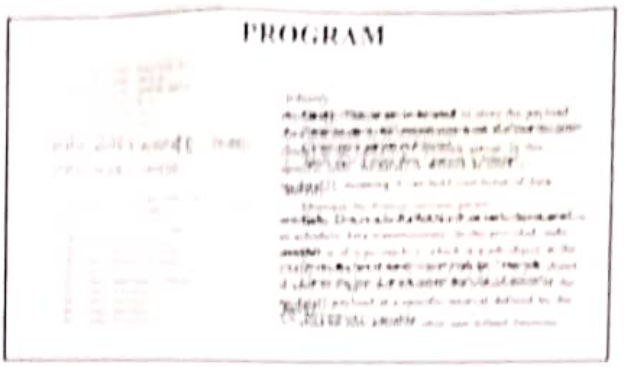


METHODOLOGY USED

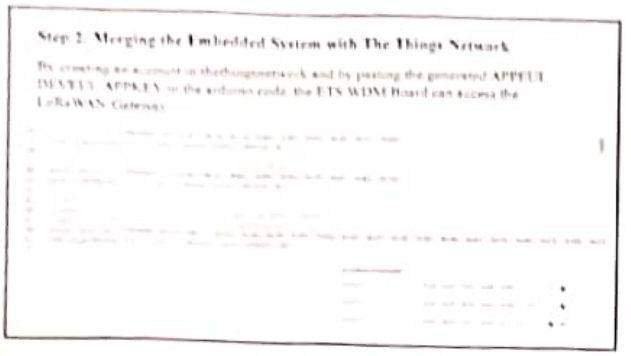
Step 1: Embedded C with Arduino IDE



PROGRAM



Step 2: Merging the Embedded System with The Things Network



OUTPUT

Step 3: Visualization

- Visualize the data that are shared to **thethingsnetwork**.

Uplink Data Message: The uplink data message contains information transmitted by the end device. This information can be sensor data, status updates, commands, or any other relevant data that the end device needs to send to the network server.

CONCLUSION

- Our smart security system signifies a significant step forward in access control and monitoring technologies. Combining ultrasonic and IR sensors with LoRaWAN communication, the system offers seamless access control and real-time monitoring. The integration of intelligent features and efficient communication with TTN empowers users with proactive security measures and remote management capabilities. The solution holds immense potential for various applications, including high-security environments and personalized access control systems.

VAC coordinator

HOD/ECE

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(An Autonomous Institution - Affiliated to Anna University, Chennai)
S.P.G. Chidambara Nadar - C.Nagammal Campus
S.P.G.C. Nagar, K. Vellakulam - 625 701, (Near Virudhunagar), Madurai District.

Submitted to the SECRETARY for approval through the PRINCIPAL

ECE

Book No. Date 09.06.202

SL.No. 5

Approval may please be granted for conduct. Value added course for III ECE students of strength 20 students on 'Internet of Things Using LORaWAN Technology' by Entin Technology Solutions India pvt ltd, coimbatore.

Tentative Date : 11.07.2023 to 15.07.2023 & 17.07.20

Kindly request you to provide hospitality for 1 resource persons during the Value added course.

Enclosure : Quotation - Registration amount - Rs.1800/student

9/6/2023
Signature of Faculty
Dr. S. NISHA RANI

9/6/23
HOD

14/6/23
PRINCIPAL

OFFICE USE

1) Account Head : Value Added Course
2) Budget allotted :
3) Amount committed / Spent sofar :
4) Balance available :

OM

Treasurer

Secretary

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S.P.G. Chidambara Nadar - C Nagammal Campus
S.P.G.C. Nagar, K. Vellakulam - 625 701, (Near Virudhunagar), Madurai District.

Submitted to the SECRETARY for approval through the PRINCIPAL

Book No

ECE

Date 18.08.2023

SL No 17

With reference to the approval granted in Sl. no. 5 for conducting Value added course for III ECE students on 'Internet of Things using LoRAWAN Technology' by Enthu Technology solutions India pvt ltd, the modified registration amount including GST is Rs. 2,124/student. Kindly grant approval

Total number of students - 20

Enclosure: Quotation (Rs 2124 * 20students = Rs 42,480/-)

18/8/2023
Signature of Faculty
S. NISHA RANI

HOD

21/8/23
PRINCIPAL

OFFICE USE

1) Account Head : Value added Course Expenses
2) Budget allotted :
3) Amount committed / Spent sofar :
4) Balance available :

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Secretary

Enthu Technology Solutions India Pvt Ltd
Plot No: 32, P.M.R Layout, 5th Street, Block - B,
Deepa Mill Road, Goldwins, Civil Aerodrome Post,
Coimbatore, Tamil Nadu - 641014,
India
GSTIN : 33AADCE9083H1ZJ

Quotation

Quotation Number	ETS/23-24/SQ/301	**Place of Supply**	Tamil Nadu
Quotation Date	04-06-2023	**Kind Attention**	Kamaraj College of Engineering and Technology
Valid Upto	19-06-2023	**Mobile Number**	(+91)4549 278171
Reference#	Your phone call dated on 03.06.2023	**Email**	mail@kamarajengg.edu.in
		Payment Terms	Immediate Payment

Bill To

Kamaraj College of Engineering and Technology
S.P.G.Chidambara nadar - C.Nagammal Campus
S.P.G.C. Nagar,K.Vellakulam
Virudhunagar , Tamil Nadu - 625701 India
(+91)4549 278171

Ship To

Kamaraj College of Engineering and Technology
S.P.G.Chidambara nadar - C.Nagammal Campus
S.P.G.C. Nagar,K.Vellakulam
Virudhunagar , Tamil Nadu - 625701 India
(+91)4549 278171

S.NO	ITEM & DESCRIPTION	HSN/SAC	QUANTITY	UNIT PRICE	EXTENDED PRICE
1	Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology	999293	20	1,800.00	36,000.00
Totals			**20**	**1,800.00 ₹**	**36,000.00 ₹**

Items in Total : 20

Sub Total	**36,000.00 ₹**
CGST	**3,240.00 ₹**
SGST	**3,240.00 ₹**
Total	**42,480.00 ₹**

Total In Words :**Forty-Two Thousand, Four Hundred And Eighty Rupees only**

Program Title: Onsite 6 day Value Added Course on Internet of Things, Using LoRaWAN Technology
The Program Proposed by: Dr.R.Sureshbabu & Dr.T.Prathipa
Eligible Branch: BE
Maximum Strength: 20
Hands-On Training Period: 6 days
Training Charges: Rs. 300 per student per day

Objective:
- To introduce the fundamental architecture of Microcontrollers
- To Learn the interface of peripheral devices (Sensors/Actuators)
- To explore the integration between Microcontroller and with LoRa-IoT platform
- Understand the concept of Wireless Communication Protocols for LoRa-IoT

Applications (Wi-Fi, Bluetooth, BLE)
- Understand the concept of MQTT, HTTP Protocols

Pre-requisite (Technical):
- Basic Knowledge of Microcontroller
- Basic Knowledge of C Programming

Topics to be covered in the Technology Training Period:
Day1
Session I
- Introduction to IoT
- IoT Applications
- IoT Architecture
- IoT Cloud platforms and utilizations
- Introduction to IoT-enabled devices
- Introduction to Embedded systems and microcontrollers
- Introduction to Arduino IDE
- Introduction to Arduino programming and library installation
- Introduction to ESP 32 microcontroller
- Basics introduction to sensor interfacing with ESP 32

For Enthu Technology Solutions India Pvt. Ltd.

Dr. K. Subramanian
Technical Lead
Enthu Technology Solutions India Private Limited
Coimbatore-04
Cell: 9944849058 | Email: subramanian@enthutech

Authorized Signature

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Coimbatore, Tamil Nadu - 641014,
India
GSTIN : 33AADCE9083H1ZJ

Session II
- Sensor interfacing with WDM
- Hands-on demo with WDM IR sensor
- Hands-on demo with WDM SHT31 sensor
- Hands-on demo with WDM DHT11 sensor

Day 2
Session I
- Thingspeak Cloud
- Data monitoring in the cloud using WDM
- Device control using Cloud platform
- Device control using Mobile application (WDM)
- Data monitoring using mobile application

Session II
- Introduction to Bluetooth
- Introduction to BLE
- Device control and data accessing using Bluetooth
- Light, Fan control Using Bluetooth
- Bluetooth Application interfacing

Day3
Session I
- Introduction to LoRa Technology & LoRaWAN Technology
- Introduction to Radio Frequency
- Node to Node Communication with LoRa
- Install LMIC Library for LoRaWAN Communication
- Customize the library for Frequency & Boards
- Pin Mapping with Hardware using

Session II
- Configure LoRaWAN Gateway in Network Server
- Uplink from End Node to Network Server using OTAA •Mode/ABP Mode
- Decoding the Received Data
- Downlink Data from Network Page to End Device

Day4
Session I
- LM35 Sensor interfacing with LoRa
- DIY: IR Sensor interfacing with LoRa
- Uplink from End Node to Network Server using OTAA Mode
- Decoding the Received Data
- Downlink Data from Network Page to End Device

Session II
- Ultrasonic Sensor interfacing with LoRa
- Uplink from End Node to Network Server using OTAA Mode
- Decoding the Received Data
- Downlink Data from Network Page to End Device
- Application server Registration

Day 5
Session I
- Introduction to ThingZmate Cloud Applications
- Gateway Configuration
- Device integration
- Data Visualization in Application Server with Multiple widgets

Session II
- Hands-on demo: Ultrasonic sensor Data visualization in Application Server

- SMS, Email Alert using ThingZmate
- Review

Day 6
- Project Support and Review

The outcome of the Course: The participants will be able to,
- Understand the importance of microcontrollers for LoRa-IoT
- Understand the concept of Wireless Communication Protocols
- Know the significance of LoRa-IoT
- Design and Develop LoRa-IoT-based applications for societal issues.

Syllabus designer for the course:
- Industry: ENTHU ACADEMIC SOLUTIONS, Academic division of Enthu Technology Solutions India Pvt. Ltd, #90, First Floor, SSN Square, Peelameduputhur, Coimbatore -641 004.

Hardware required: (Provided By Industry on a returnable basis to each batch)
- Wireless Development Board(WDM)

Sensor & Actuators Used for Practical Learning: (Provided By Industry on a returnable basis to each batch)
- LED - 3 qty
- Soil Moisture Sensor - 1 qty
- BH1750 Sensor - 1 qty
- IR sensor - 1 qty
- Ultrasonic Sensor - 3 qty
- PIR Sensor - 1 qty
- Flame Sensor - 1 qty
- DHT11 Sensor -3 qty
- LM35 Sensor - 3 qty

Software required: (Provided By Industry to each batch)
- Arduino IDE
- ESP32 dev library

Infrastructure Requirements from Institution for Hands-on :
- Individual PC / Laptops are mandatory
- Projector classroom & Board with Marker
- 230V, 5A Socket for Development Board-Power Supply
- Uninterrupted WiFi without Firewall(Most Mandatory)
- Multimeter and necessary extension boxes.
- Audio systems: Mic & Speaker

Benefits to the Participants:
- Exposure to Latest Technologies
- Participating in National and International Contests
- Exposure to Project Development
- Opportunity to become an Entrepreneur
- Placement Opportunities

Terms & Conditions:
- Payment: Immediate Payment
- Mode of Training: Onsite/ Institute
- Duration of Training: 6 days, 5 hours per day
- Session of Training: 2 per day
- Batch Size: 20
- Training date: June 2023

Additional:

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GSTIN : 33AADCE9083H1ZJ

TA & DA applicable for Enthu Tech Resource Person (Actual)
1. Resource person's travel will be taken care of by Enthu Tech
2. Food & accommodation will be provided at the Institute Guest House/Outside of the Campus

- We will give our kits (which will carry from our team) to the participants on a returnable basis(15 kits for 15 batches, 2 participants for each batch)
- During Practical if Hardware Damage caused by students i.e. will be charged from students(Institute should support for this)
- In case of any development and issues with your hardware our resource team won't take responsibility for developing and rectifying your hardware at that period of time

Bank Account Details
Bank Name ICICI Bank
A/c Name Enthu Technology Solutions India Pvt Ltd.
Branch Coimbatore - Ram Nagar
A/c No. 615205045092
IFSC Code ICIC0006152

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GSTIN : 33AADCE9083H1ZJ

TAX INVOICE

Invoice Number	ETS/23-24/IN/305	**Place of Supply**	Tamil Nadu
Invoice Date	25-08-2023	**Kind Attention**	Kamaraj College of Engineering and Technology
Payment Terms	Immediate Payment	**Mobile Number**	(+91)4549 278171
Payment Due Date	25/Aug/2023	**Email**	mail@kamarajengg.edu.in
Customer Reference	Your phone call dated on 03.06.2023	**Customer Comments**	
E-Way Bill Number	[redacted]	**Acknowledge Date**	
		Acknowledge No	[redacted]

IRN Number

Bill To
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(+91)4549 278171

S #	ITEM & DESCRIPTION	HSN	QTY	UNIT PRICE	CGST		SGST		EXTENDED PRICE
					RATE	AMOUNT	RATE	AMOUNT	
1	Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology	999293	20	1,800.00	9.0 %	3240.00	9.0 %	3240.00	36,000.00
Totals			**20**	**1800.00 ₹**		**3240.00 ₹**		**3240.00 ₹**	**36000.00 ₹**

Items in Total : **20**
Thanks for your business.

Program Title: Onsite 6 day Value Added Course on Internet of Things Using LoRaWAN Technology
The Program Proposed by: Dr.R.Sureshbabu & Dr.T.Prathipa
Eligible Branch: BE
Maximum Strength: 20
Hands-On Training Period: 6 days
Training Charges: Rs. 300 per student per day

Objective:
- To introduce the fundamental architecture of Microcontrollers
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- Understand the concept of Wireless Communication Protocols for LoRa-IoT

Applications (Wi-Fi, Bluetooth, BLE)
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Topics to be covered in the Technology Training Period:
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- IoT Architecture

Sub Total	**36,000.00 ₹**
CGST	**3240.00 ₹**
SGST	**3240.00 ₹**
Total	**42,480.00 ₹**
Payment Made	(-) 0.00 ₹
Balance Due	**42,480.00 ₹**

Total In Words : **Forty-Two Thousand, Four Hundred And Eighty Rupees only**

For Enthu Technology Solutions India Pvt. Ltd.

ENTHU TECHNOLOGY SOLUTIONS INDIA PVT. LTD. CBE-4

Dr. K. Subramanian
Technical Lead
Enthu Technology Solutions India Private Limited
Coimbatore-04
Cell: 9944849058 | Email: subramanian@enthutec

Enthu Technology Solutions India Pvt Ltd
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India
GSTIN : 33AADCE9083H1ZJ

Proforma Invoice

ETS/22-23/PI/302

Syllabus

Proforma Invoice Date	04-06-2023	**Place of Supply**	Tamil Nadu
Valid Upto	19-06-2023		
Reference#	Your phone call dated on 03.06.2023		

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- Introduction to Arduino IDE
- Introduction to Arduino programming and library installation
- Introduction to ESP 32 microcontroller
- Basics introduction to sensor interfacing with ESP 32

Session II
- Sensor interfacing with WDM

Sub Total	**36,000.00 ₹**
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Dr. K. Subramanian
Technical Lead
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Coimbatore-04
Cell: 9944849058 | Email: subramanian@enthutech

Authorized Signature

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- Hands-on demo with WDM IR sensor
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Day 2
Session I
- Thingspeak Cloud
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- Device control using Cloud platform
- Device control using Mobile application (WDM)
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- Ultrasonic Sensor interfacing with LoRa
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- Decoding the Received Data
- Downlink Data from Network Page to End Device
- Application server Registration

Day 5
Session I
- Introduction to ThingZmate Cloud Applications
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- Device integration
- Data Visualization in Application Server with Multiple widgets

Session II
- Hands-on demo: Ultrasonic sensor Data visualization in Application Server
- SMS, Email Alert using ThingZmate
- Review

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Day 6
• Project Support and Review

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• Training date: June 2023

Additional:
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