Course Handout for 4th YearB.Tech Program

Course Title	: Internet of Things (OE-EC 803A)
Course Code	: OE-EC 803A
L-T-P-S Structure	: 3-0-0-0
Credits	: 3
Pre-requisite	:Knowledge of Wireless Communication and Networking
Course Coordinator	:Dr. Mithun Chakraborty & Dr. Debajyoti Misra

Course Objective: Students will be able to understand the application areas of IOT & realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.

COURSE OUTCOMES (COs): (According to the University guideline)

CO No	Course Outcome (CO)	Blooms Taxonomy Level (BTL)	Target %
CO1	understand the application areas of IOT	2	60
CO2	realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.	2	60
CO3	understand building blocks of Internet of Things and characteristics	2	60

PROGRAM OUTCOMES(POs):

PO Number	Description
1. Engineering Knowledge	Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem Analysis	Identify, formulate, review research literature, and analyze complexengineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/ development of solutions	Design solutions for complex engineering problems anddesign system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO Number	Description
4. Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage	Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society	Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability	Understand the impact of the professional engineering solutionsin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.
9. Individual and team work	Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.
10. Communication	Communicate effectively on complex engineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance	Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Lifelong learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadestcontext of technological change.

Mapping of Course Outcomes and Program Outcomes: (Sample Attached)

Course Outcomes	Program Outcomes												PSOs	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10	11	12	1.	2.
CO1	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	2	2	-	-	-	-	-	-	-	-	-	1	1	-
OE-EC 803A	2	2	-	-	-	-	-	-	-	-	-	1	1	-

SYLLABUS:

Module I   3L

The flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.

Module II   4L

Design Principles for Connected Devices:
Calm and Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for Connected Devices, Affordances, The Business Model.

Module III   4L

Internet Communications: An Overview (IP, TCP, The IP Protocol Suite (TCP/IP), UDP), IP Addresses (DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6), MAC Addresses, TCP and UDP Ports, Application Layer Protocols.

MODULE IV

Prototyping   4L

Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Open Source versus Closed Source, Tapping into the Community.

MODULE V   4L

Prototyping Embedded Devices:
Electronics, Embedded Computing Basics, Developing on the Arduino, Raspberry Pi, Beaglebone Black, Electric Imp, Mobile Phone and Tablets, Plug Computing: Always-on Internet of Things.

MODULE VI   4L

Prototyping the Physical Design:
Preparation, Sketch, Iterate, and Explore, Non-digital Methods, Laser Cutting, 3D Printing, CNC Milling, Repurposing/Recycling.

MODULE VII   4L

Prototyping Online Components:
Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols.

MODULE VIII   4L

Memory Management, Performance and Battery Life, Libraries, Debugging.

IX. Prototype to Reality: 4L

Business Models: A Short History of Business Models, The Business Model Canvas, Who Is The Business Model for model, Funding an Internet of Things Startup, Lean Startups

MODULE X   4L

Moving to Manufacture, What Are You Producing, Designing Kits, Designing Printed Circuit Boards, Manufacturing Printed Circuit Boards, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software.

TEXT/ REFERENCE BOOKS:

1. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wileypublication, 1st Edition, November 2013.   .

2. Jeeva Jose, Internet of Things, Khanna Publishing House, New Delhi (AICTE Recommended – 2018)

COURSE DELIVERY PLAN: BRACKET IN SESSION INDICATES NO. OF CLASS

Week	Sess. No.	CO	Topic (s)	Book No [CH No][Page No]	Teaching-Learning Methods	Planned Date	Execution Date
1st	1	CO1	The flavour of the InternetofThings,The"Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?	Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wileypublication, 1st Edition, November 2013.	T: PPT L: Observes understands	05.01.2023 & 06.01.2023	
2nd	2	CO1	Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions.	Online Resource https://www.researchgate.net/publication/332859761_IoT_Security_Privacy_Safety_and_Ethics https://e-tarjome.com/storage/panel/fileuploads/2021-07-28/1627456237_E15542.pdf https://www.slideshare.net/alengadan/ethicsinternet-of-things	T: PPT L: Observes understands	09.01.2023 & 10.01.2023	
2nd	3	CO1	Design Principles for Connected Devices:Calm and Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for Connected	Online Resource https://www.studocu.com/in/document/bharathiar-university/bsc-computer-science/2-design-principles-for-connected-	T: PPT L: Observes understands	13.01.23 to 14.01.23	

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			Devices, Affordances, The Business Model	devices-e-next/34918673 https://siesce.edu.in/docs/resources/Unit%201-%20Chapter%202_34002.pdf				
3rd	4	CO2	**Internet Principles:**Internet Communications: An Overview (IP, TCP, The IP Protocol Suite (TCP/IP), UDP), IP Addresses (DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6), MAC Addresses, TCP and UDP Ports, Application Layer Protocols.	Data Communications and Networking By Behrouz A. Forouzan	T: PPT L: Observes understands	16.01.23 to 20.01.23	
4th	5	CO2	**Prototyping** Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Open Source versus Closed Source, Tapping into the Community.	Industry Expert		T: PPT L: Observes understands	24.01.23 to 27.01.23	
5th	6	CO2	**Prototyping Embedded Devices:** Electronics, Embedded Computing Basics,	Industry Expert		T: PPT L: Observes understands	30.01.23 to 03.02.23	

			Developing on the Arduino, Raspberry Pi, Beaglebone Black, Electric Imp, Mobile Phone and Tablets, Plug Computing: Always-on Internet of Things.				
6th	7	CO2	**Prototyping the Physical Design:** Preparation, Sketch, Iterate, and Explore, Non-digital Methods, Laser Cutting, 3D Printing, CNC Milling, Repurposing/Recycling.	Industry Expert	T: PPT L: Observes understands	06.02.23 to 10.02.23	
7th	8	CO3	**Prototyping Online Components:** Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols.	Online resource https://www.pvpsiddhartha.ac.in/dep_it/lecture%20notes/IOT/UNIT-5.pdf	T: PPT L: Observes understands	13.02.23 to 17.02.23	
8th	9	CO3	**MODULE VIII** Memory Management, Performance and Battery Life, Libraries, Debugging.	Industry Expert	T: PPT L: Observes understands	20.02.23 to 24.02.23	
9th	10	CO3	Business Models: A Short History of Business Models, The Business Model Canvas, Who Is The Business Model for model, Funding an Internet of Things Startup, Lean Startups	Industry Expert	T: PPT L: Observes understands	27.02.23 to 03.03.23	
10th	11	CO3	Moving to Manufacture, What Are You	Industry Expert	T: PPT L: Observes understands	06.03.23-10.03.23	

		Producing, Designing Kits, Designing Printed Circuit Boards, Manufacturing Printed Circuit Boards, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software.				

LIST OF TUTORIALS:OPTIONAL

Tutorial session no	Topics	CO-Mapping
	NA	

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDEDED PROBLEM-SOLVING EXERCISES etc.

Week	Assignment/Quiz	Topic	Details	CO
2	A01	Application Area of IoT	Application areas of IoT specifically for I. Industrial safety and security, ii. II. smart city III. self-driven car, IV. farming where it is used directly formankind	CO1
4	A02	Technology of Internet of Things	i. How RFID network connected devices work? ii. What is wireless LAN? iii. What data rates are available with WLAN network connection? iv. Write short notes on RF to DC technology?	CO2
5	A03	Internet Principles	v. Discuss the Methods of Assigning IP Addresses. Discuss dynamic IP address in detail with suitable block diagram and compare static IP with dynamic IP. Discuss IPv6 addressing scheme with suitable block diagram. What are the benefits of using IPV6 in IOT?	CO2

6	A04	Prototyping the Physical Design	vi.	Discuss prototyping the physical design Non digital methods also discuss the different types of 3D printing. State the memory management issues in embedded code. Explain organizing RAM: Stack versus Heap.	CO3

COURSE TIME TABLE

SILIGURI INSTITUTE OF TECHNOLOGY
Department of ECE
B-TECH 8TH SEMESTER ROUTINE 2023

DAY	DEPT	10:00-10:50	10:50-11:40	11:40-12:30	12:30-13:20		14:10-15:00	15:00-15:50	15:50-16:40
MON	ECE A	PROJECT-A					GD/APT(A)		
	ECE B	Antenna(DG)	Antenna(DG)	MW(SB)	IoT(DM) / CS(ASG)		PROJECT-B		
TUE	ECE A	MW(SB)	MW(SB)	VLSI(MKP)	VLSI(MKP)		SOFT SKILL		
	ECE B		IoT(DM) / CS(ASG)	Antenna(DG)	MW(SB)				
WED	ECE A	Antenna(DG)		Mentor Meet		Lunch	GRAND VIVA PREP. A		
THU	ECE A	IoT(DM) / CS(ASG)	Antenna(DG)	CLUB ACTIVITY			PROJECT-A		
	ECE B	VLSI(MKP)	VLSI(MKP)				GD/APT(B)		
FRI	ECE A	Doubt clearing	Antenna(DG)	VLSI(MKP)	MW(SB)		IoT(DM) / CS(ASG)	IoT(DM) / CS(ASG)	Library
	ECE B	Doubt clearing	VLSI(MKP)	MW(SB)	IoT(DM) / CS(ASG)		GRAND VIVA PREP. B		

REMEDIAL CLASSES:

Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified accordingly.

DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

Sl.No	Advanced Topics, Additional Reading, Research papers and any	CO	POs & PSOs	ALM	References/MOOCS
1	Demonstration of Realtime time application of IoT	CO1	PO1 & PSO 1	Quiz	
2	Use of RF to DC conversion in IOT field	CO2	PO1 & PSO1	PPT	

EVALUATION: AS PER MAKAUT GUIDELINES

Schedule for Continuous Assessment (CA):

CA	Assessment By	Schedule
CA-I	Presentation, Quiz, Group Discussion	
CA-II	Report writing	
CA-III	Class test in pen and paper mode to be conducted at the College Level	As per Academic Calendar
CA-IV	Centralized online test to be arranged by theUniversity	
PCA1	Rubrics based Evaluation and Viva -Voce	
PCA2	Rubrics based Evaluation and Viva -Voce	

ATTENDANCE POLICY

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfil all other tasks assigned to him/her in every course. For Promotion, a Minimum of 50% of internal marks must be obtained. In every course, student has to maintain a minimum of 75% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 60% to 75% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments.

DETENTION POLICY

In any course, a student has to maintain a minimum of75% attendance and must secure a minimum of 50% marks in In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY

Use of unfair means in any of the evaluation components will be dealt with strictly, and the case will be reported to the examination committee.

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Each instructor will specify his / her chamber consultation hours during which the student can contact him / her in his / her chamber for consultation.

S.No.	Name of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty
1	Dr.MithunnChakraborty& Dr. Debajyoti Misra	Mon-Fri	1:20-2:10PM	Room No-M-234	*Debajyoti Misra*

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

All notices will be communicated through the institution email.
All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR: *[signature] 9.1.23*
Debajyoti Misra 10.1.23

[signature] 13/01/23

HEAD OF DEPARTMENT: *[signature] 10/1/23*

Approval from: Head of the Institutions
(Sign with Office Seal)

Principal
Siliguri Institute of Technology

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