



DEPARTMENT OF INTERNET OF THINGS

Date:14/08/2025

KLEF/ IOT/ IQAC - ACAD/ AQ.5/ DCMs /5.3/09

MINUTES OF IX BOARD OF STUDIES MEETING

The Department Board of Studies meeting was held online on August 14, 2025, from 2:00 PM to 5:00 PM with Dr. P. Satyanarayana HoD-IoT as a chair.

The following members are present.

1. Dr.P.Satyanarayana, Professor & HoD, KLEF, BoS -Chairperson
2. Dr. Ravi Kumar Jatoth, Professor, Department of ECE, National Institute of Technology, Warangal, Telangana, INDIA., External BoS Member
3. Dr Ramesh Kumar Mojjada, Associate Architect AI, Renault Nissan Technology & Business Centre, India., External BoS member
4. Mr.Murali Krishna Vemuri, Director, software engineer, BlackBerry-QNX, Hyderabad, Telangana, External BoS member
5. Dr.PSG Aruna Sri, Professor, KLEF, Faculty Representatives
6. Dr.JRK Kumar, Associate Professor, KLEF, Faculty Representatives
7. Dr.K.V.D.Sagar, Associate Professor, KLEF, Faculty Representatives
8. Dr.Sridevi , Assistant Professor, KLEF, Faculty Representatives
9. Dr.Ch.Bhupathi, Assistant Professor, KLEF, Faculty Representatives
10. Dr.K.T.P.S.Kumar, Alt. Head, Assistant Professor, KLEF, Faculty Representatives
11. Dr. N.Venkatram , Professor& Pro-VC, KLEF, **Special Invitee**
12. Sri Harikiran Vegi, Additional Dean Academics, KLEF, **Special Invitee**
13. Dr.P.Vidya Sagar, Associate Dean Academics, KLEF, **Special Invitee**
14. Dr.K.V.D.Kiran, Professor in CSE, KLEF, Faculty Representatives
15. Dr. N.Konda Reddy , Assoc Professor, Dept. of Mathematics., KLEF Faculty Representatives
16. Dr. L.Lavanya, Professor & Head, Dept. of English, KLEF, Faculty Representatives
17. Mr. Siddarth, Sr.Software developer, L&T, Bangalore, Alumni
18. Mr. Satvik, Software Developer, Deloit, Hyderabad, Alumni
19. Kavya Adepalli, Application Engineer, Synopsys Inc, Hyderabad, Alumni
20. Ms. M.Lahari Krishna, B. Tech-IV/IV, KLEF, Student Representative
21. MUDDINENI ARSHA VENKATA SIVA NAGA JYOTHI, Student Representative

The following members are Absent:

Nil



Dr. P. Satyanarayana, Chairman of the BoS, opened the meeting with a welcome address, introducing the external members to the internal and special invitee members. He expressed gratitude for their acceptance of serving on the Board of Studies. The Chairman then presented the agenda items to the board.

The following agenda items were submitted for deliberation by the Board of Studies on the Internet of Things at the current meeting:

AGENDA ITEMS

1. To consider and approve the Department Academic Committee (DAC) minutes held on August 11, 2025.
2. Consider and approve the B. Tech (IoT) program structure and syllabus for Y25 regulation.
3. To consider and approve the revision of the B.Tech (IoT) program structure and syllabus for Y24 regulation.
4. To consider and approve the Program Development Documents (PDDs) of the Y24 and Y25 regulations.
5. Any other point to discuss with permission from the BoS Chair.

AGENDA AND RESOLUTIONS

AGENDA ITEM-1

Description	Resolution Passed
To consider and approve the Department Academic Committee (DAC) minutes held on August 11, 2025.	Approved. Forwarded to the academic council for further approval.

Resolution:

The Chairman of the BoS informed members of the Department Academic Committee (DAC) meeting held on August 11, 2025, and highlighted the major resolutions discussed. These resolutions were unanimously approved by the BoS (details are shown in **Annexure: 01**).

AGENDA ITEM-2

Description	Resolution Passed
Consider and approve the B. Tech (IoT) program structure and syllabus for Y25 regulation.	Approved. Forwarded to the academic council for further approval.

Resolutions:

- 1) The chairman of the BoS presented the program structure of the B.Tech(IoT) Y25 Regulation and a detailed discussion of the courses and syllabus.
- 2) The Chairman of the BoS presented the proposed new courses for the B.Tech (IoT) program based on stakeholder feedback for students admitted to the Y25 batch.
 - a. Based on local needs, industry personnel proposed introducing the EMBEDDED LINUX course to B. Tech (IoT) students.
 - b. Based on local needs, industry personnel proposed introducing the IoT EDGE COMPUTING course for B. Tech (IoT) students.
 - c. Based on local and regional needs, industry personnel proposed introducing the BLOCKCHAIN TECHNOLOGY FOR IoT course for B. Tech (IoT) students.
 - d. Based on local and regional needs, industry personnel proposed introducing the GENERATIVE AI course for B. Tech (IoT) students.

Sl.No	Course Title	Course type	Remarks
1	EMBEDDED LINUX	Honors	It is introduced based on stakeholders' feedback
2	IoT EDGE COMPUTING	Honors	It is introduced based on stakeholders feedback
3	BLOCKCHAIN TECHNOLOGY FOR IoT	Honors	It is introduced based on stakeholders feedback
4	GENERATIVE AI	Honors	It is introduced based on stakeholders feedback

- 3) The chairman of the BoS presented courses for IoT double-major students for mapping courses with NPTEL for 40 credits.
- 4) He presented honors courses for B.Tech(Honors) students with additional **20** credits.
- 5) He explains different specializations and flexibilities offered to B.Tech(IoT)students.
 - a. Honors through Innovation
 - b. Honors through Research
 - c. Honors for experiential learning
 - d. Double major

All the members are agreed and approved for proposed program structure and syllabus of B.Tech(IoT)Y25 regulation and forwarded to academic council for further approval(details are shown in **Annexure: 02**).

AGENDA ITEM-3

Description	Resolution Passed
To consider and approve the revision of the B.Tech (IoT) program structure and syllabus for Y24 regulation.	Approved. Forwarded to the academic council for further approval.

Resolutions:

1. The Chairman of the BoS presented the proposed new courses for the B.Tech (IoT) program based on stakeholder feedback for students admitted to the Y24 batch.
 - a. Based on local needs, industry personnel proposed introducing the course ANALOG ELECTRONIC CIRCUIT DESIGN to B. Tech (IoT) students.

Sl.No	Course code	Course Title	Course type	Remarks
1	25EC2107	ANALOG ELECTRONIC CIRCUIT DESIGN	PCC	It is introduced based on stakeholders' feedback

2. The chairman of the BoS proposed to the syllabus revision of the course IoT System Design based on industry personal feedback
3. The chairman of the BoS proposed to the syllabus revision of the course WIRELESS TECHNOLOGIES FOR IoT based on industry personal feedback
4. The chairman of the BoS proposed to the syllabus revision of the course Cloud computing for IoT based on industry personal feedback
5. The chairman of the BoS proposed to the syllabus revision of the course IoT Hardware Programming based on industry personal feedback

All members agreed upon, approved, and forwarded further approval to the academic council. The details are shown in (**Annexure 03**)

AGENDA ITEM-4

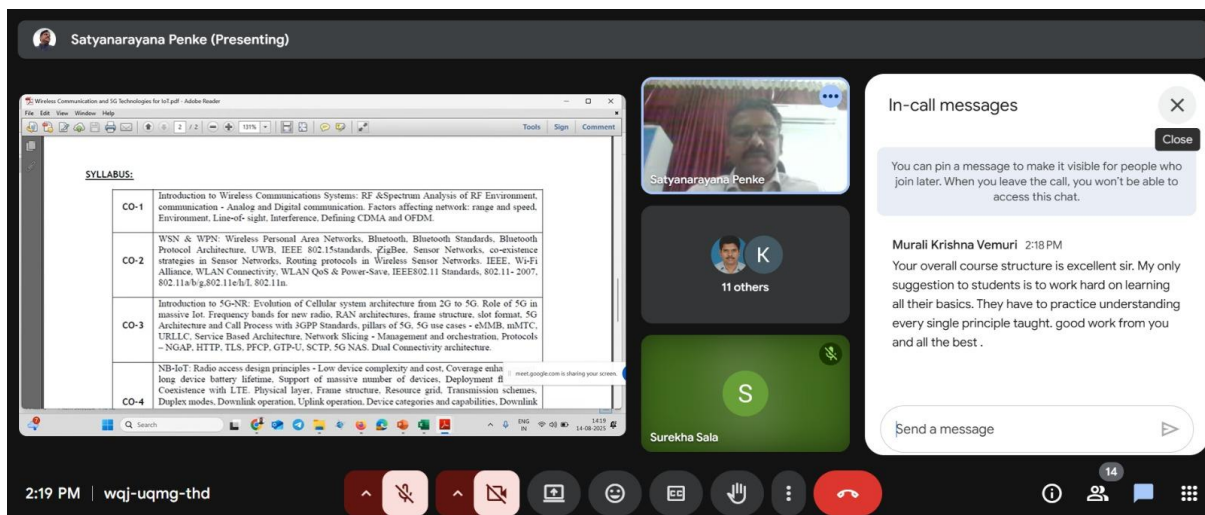
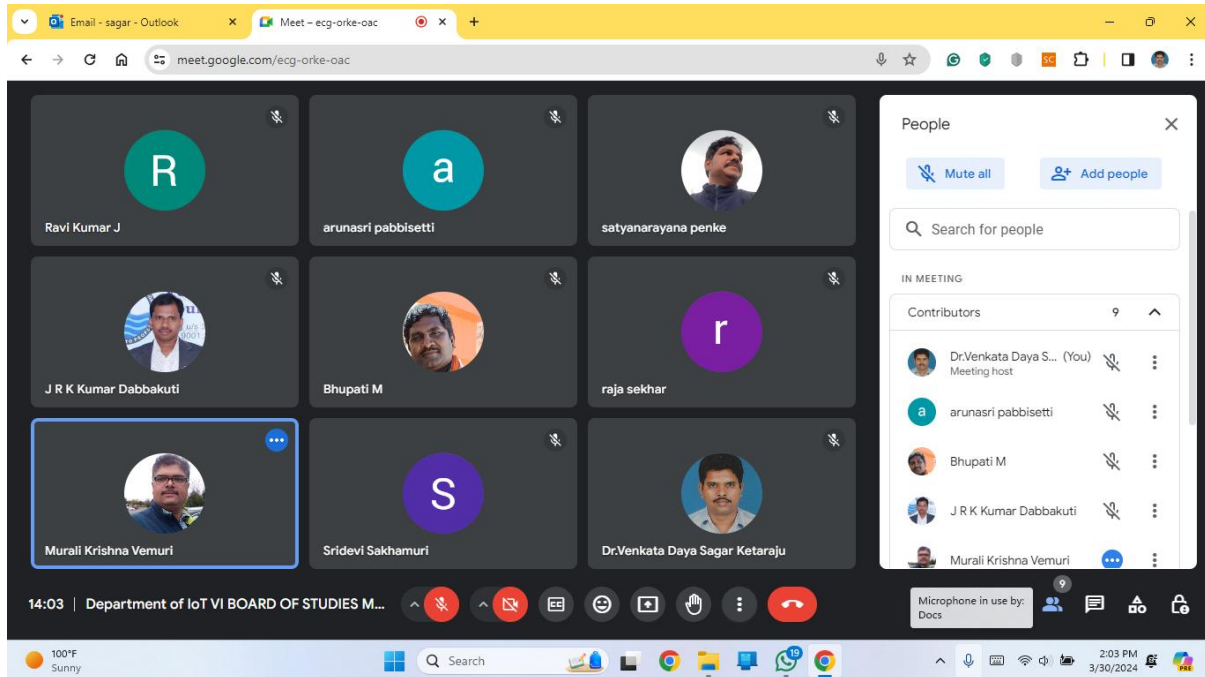
Description	Resolution Passed
To consider and approve the Program Development Documents (PDDs) of the Y24 and Y25 regulations.	Approved. Forwarded to the academic council for further approval.

Resolutions:

- 1) The Chairman of the BoS presented the Program Development Documents (PDDs) for the B.Tech (IoT) Y25 Regulation and proposed changes to the Y24 Regulation.
- 2) The newly proposed PEOs, POs, and PSOs were adopted to map the COs, and an articulation matrix was prepared to align courses and programs with the updated POs and PSOs.
- 3) All members unanimously approved the PDDs for the B.Tech (IoT) Y24 Regulation (with proposed changes) and the Y25 Regulation.(details shown in **Annexure:04**)



Photographs of BoS Meeting





Photographs of BoS Meeting

Annexure 01

DAC minutes and relevant annexures

- a) Action taking report on feedback received from stakeholders.

BoS - Annexure-2

Report- Analysis of Feedback on the curriculum – received from the stakeholders prior to the commencement of the Academic Year 2025-26-ODD Semester

S. No.	Type of Stakeholder	Number of feedbacks
1	Students	25
2	Parents	15
3	Alumni	10
4	Faculty	13
5	Academic peers	5
6	Industry persons	5
Total		68

The following recommendations are resolved and recommended to BoS

S. No.	Recommendations	Action Taken
Students Feedback		
1	Mr. S.D. Pavan Kumar (ID: 2100100010) suggested including “Problem Solving through C Language” in the B.Tech (IoT) curriculum to strengthen students foundational programming skills and enhance their ability to develop logical and structured solutions to problems.	It is resolved to introduce the course Problem Solving through C in the B.Tech (IoT) curriculum.
2	Ms. P. Harshitha (ID: 2100100019) suggested including concepts such as integrated circuits and triple five timers in the B.Tech (IoT) curriculum to help students gain a strong foundation in analog component behavior, amplifier and filter design.	It is resolved to incorporate those concepts and introduce the course Analog Electronic Circuit Design in the B.Tech (IoT) curriculum
3	Ms. G. Chandrika (ID: 2200100002) suggested including “ Python Programming ” concepts in the B.Tech (IoT) curriculum to strengthen students’ skills in high-level programming, data handling, and rapid application development, which are essential for IoT system design, data analysis, and AI/ML integration.	It is resolved to introduce the course Python Programming in the B.Tech (IoT) curriculum.
4	Ch. Rohitha (ID: 2200100006) suggests including security concepts in the context of IoT devices in the B.Tech (IoT) curriculum.	It is resolved to incorporate security concepts related to IoT devices into the <i>Blockchain Technologies for IoT</i> course in the B.Tech (IoT) curriculum



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5	Ms. Tanisha Anil Nikkam (ID: 2200100007) suggested including “Embedded Linux” concepts in the B.Tech (IoT) curriculum to equip students with the knowledge and skills required for developing, configuring, and deploying IoT applications on Linux-based embedded systems, enabling efficient device management and real-time processing in IoT environments.	It is resolved to introduce the course Embedded Linux in the B.Tech (IoT) curriculum.
6	Mr. V. Srinadth (ID: 2100100044) suggested including “Edge Computing for IoT” concepts in the B.Tech (IoT) curriculum to understand decentralized data processing, real-time analytics, and efficient resource management at the edge of the network, which are vital for scalable and responsive IoT systems.	It is resolved to introduce the course IOT EDGE COMPUTING in the B.Tech (IoT) curriculum.

Faculty Feedback

1	Dr. K T P S Kumar suggested including a dedicated course on “Analog Electronic Circuit Design” in the B.Tech (IoT) curriculum to provide students with a solid understanding of analog circuits, device behavior, and signal processing techniques essential for designing reliable IoT hardware systems.	It is resolved to introduce the course Analog Electronic Circuit Design in the B.Tech (IoT) curriculum.
2	Dr. Ch. Bhupathi, Assistant Professor, suggested including IoT system design concepts for implementing various industrial use cases using SCADA and PLC in the B.Tech (IoT) curriculum	It was resolved to incorporate IoT system design concepts for implementing industrial use cases using SCADA and PLC into the IoT System Design course for B.Tech (IoT) students.

Industry Personnel Feedback

1	Mr. V. Praneeth, Senior Software Engineer at Infosys, Bangalore, advised including “Problem Solving through C” in the B.Tech (IoT) curriculum to strengthen students’ foundational programming skills, logical thinking, and algorithmic problem-solving abilities, which are crucial for embedded system development and IoT application programming.	It is resolved to introduce the course Problem Solving through C in the B.Tech (IoT) curriculum.
2	Mr. Murali Krishna Vemuri, Director and Software Engineer at BlackBerry-QNX, Hyderabad, Telangana, suggested including “Embedded Linux” concepts in the B.Tech (IoT) curriculum to prepare students for	It is resolved to introduce the course Embedded Linux in the B.Tech (IoT) curriculum.



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	real-world IoT system development, focusing on Linux-based embedded platforms, device drivers, and real-time operating system integration.	
4	Mr. M. D. V. S. Sundar, Delivery Manager at L&T, Hyderabad, suggested including “Python Programming” concepts in the B.Tech (IoT) curriculum to enhance students’ capabilities in scripting, automation, data analysis, and AI/ML integration, which are essential skills for modern IoT development.	It is resolved to introduce the course python programming in the B.Tech (IoT) curriculum

Academic Peers Feedback

1	Dr. J. Ravi Kumar, Professor, NIT Warangal, suggested the inclusion of Blockchain Technology for IoT concepts and Container Technologies for IoT Projects in the B.Tech (IoT) curriculum.	It is resolved to introduce the course Blockchain Technology for IoT in the B.Tech (IoT) curriculum
2	Dr. J. ArulValan, Assistant Professor at NIT Nagaland, suggested the inclusion of <i>Deep Learning with Computer Vision</i> concepts such as Self-Supervised and Unsupervised Learning, Attention Mechanisms, Vision Transformers (ViTs), and Hardware Acceleration in the B.Tech (IoT) curriculum to enable students to acquire advanced skills in AI-driven image processing, object detection, and real-time visual analytics applicable to IoT systems.	It is resolved and partially agreed to incorporate the concepts of Self-Supervised and Unsupervised Learning, Attention Mechanisms, Vision Transformers (ViTs), and Hardware Acceleration through the course <i>Deep Learning with Computer Vision</i> already existing in the B.Tech (IoT) curriculum.
3	Dr. Shashank Srivastava, Assistant Professor in the Department of Computer Science at the University of North Carolina at Chapel Hill, is recommended for the inclusion of software engineering concepts in the B.Tech (IoT) program.	It is resolved to include software engineering concepts in the Adaptive Software Engineering course in the B.Tech (IoT) curriculum.

Parents Feedback

1	Mr. G Kiran Kumar suggested including Wi-Fi hardware and software tools for wireless technologies for IoT.	It is resolved to include Wi-Fi 6 & BLE development kits and software tools Texas Instruments Wi-Fi SDK Toolkit for CC3200/CC3220 modules, supporting connectivity stacks, drivers, and integrated security concepts in the Wireless Technologies for IoT course for B.Tech (IoT) students.
2	Smt. V. Syamala suggests including courses on Flutter for building mobile apps in the B.Tech (IoT) curriculum.	It is partially considered to include the Flutter framework in the IoT Full Stack Development course in the B.Tech (IoT) curriculum.



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3	Mr. Ramprasad suggests including AI and machine learning related concepts in the B.Tech (IoT) curriculum.	It is not considered, as those concepts already exist in the courses Artificial Intelligence and Machine Learning in the B.Tech (IoT) curriculum
Alumni Feedback		
1	Mr. Siddarth, Software Engineer at L&T, Bangalore, suggested integrating practical exposure to commercial IoT cloud platforms in the B.Tech (IoT) curriculum. Specifically, he recommended including hands-on modules on AWS IoT Core, Microsoft Azure IoT Hub, and Google Cloud IoT Core to enable students to effectively interface embedded systems with leading cloud services for scalable and secure IoT solutions.	Based on the recommendation from Mr. Siddarth, Software Engineer at L&T, Bangalore, practical modules on AWS IoT Core, Microsoft Azure IoT Hub, and Google Cloud IoT Core have been incorporated into the B.Tech (IoT) curriculum. These modules will be included in the third year to provide students with hands-on experience in cloud-based IoT platform integration, enabling them to develop scalable, secure, and industry-relevant IoT applications.
2	Mr. T. S. V. Rajeev, Software Developer at Capgemini, Bangalore, recommended the integration of Large Language Model (LLM) capabilities and Generative AI concepts into the B.Tech (IoT) curriculum. This enhancement is aimed at enabling students to design and develop IoT systems that leverage advanced AI-driven natural language processing (NLP) for smart devices, conversational interfaces, and innovative human-machine interactions.	It is resolved to introduce the course Generative AI in the B.Tech (IoT) curriculum



Annexure 02

Department of Internet of Things

B.Tech(IoT) Category Wise Course Structure(Y25 Regulation)

Sl No	Cat egor y	Course Code	Course Title	L	T	P	S	Cr	C H	Pre-requis ite	New Course/ Revised Course/ Retaine d Course	Cha nge s Pro posed by	Focused on Employabi lity/ Entrepren eurship/ Skill Developme nt	Justification
1	AU C	25UC0017	INDIAN ANCIENT KNOWLEDGE SYSTEMS : VEDIC MATHEMATICS	2	0	0	0	0	2	NIL	Retained			
2	AU C	25UC0032	INSIGHTS TO SUSTAINABLE DEVELOPMENT GOALS	2	0	0	0	0	2	NIL	new			
3	AU C	25UC0008	INDIAN CONSTITUTION	2	0	0	0	0	2	NIL	Retained			
4	AU C	25UC0009	ECOLOGY AND ENVIRONMENT	2	0	0	0	0	2	NIL	Retained			
5	HA S	25UC1102	LANGUAGE SKILLS FOR ENGINEERS	0	0	4	0	2	4	NIL	retained	BoS me mbe r	Employabil ity	helps the students attain better employment
6	HA S	25UC1204	COMMUNICATION SKILLS FOR ENGINEERS	0	0	4	0	2	4	NIL	retained		Employabil ity	helps the students attain better employment



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7	HA S	25UC0026	HUMAN VALUES, GENDER EQUALITY AND PROFESSIONAL ETHICS	2	0	0	0	2	2	NIL	Retained		Sociality	The basic course helps better understand society
8	HA S	25UC1203	DESIGN THINKING FOR INNOVATION	0	0	4	0	2	4	NIL	Retained		Entrepreneurship	The course helps towards entrepreneurship
9	HA S	25UC0021	SOCIAL IMMERSIVE LEARNING-1	0	0	0	4	1	4	NIL	Retained		Skill development	The course helps the students to understand societal problems and provide engineering solutions to overcome
10	HA S	25UC0022	SOCIAL IMMERSIVE LEARNING - 2	0	0	0	4	1	4	NIL	Retained		Skill development	The course helps the students to understand societal problems and provide engineering solutions to overcome
11	HA S	23MBXXXX	MANAGEMENT ELECTIVE	2	0	0	0	2	2	NIL	Retained		Employability	Students attain better employability
12	HA S	23FLXXXX	FOREIGN LANGUAGE ELECTIVE	2	0	0	0	2	2	NIL	Retained		Employability	Students attain better employability
Total				8	0	16	0	16	24					



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13	BSC	25MT1001	LINEAR ALGEBRA AND CALCULUS FOR ENGINEERS	2	2	0	0	4	6	NIL	Retained		Employability	The basic course helps better employment
14	BSC	25MT1002	DISCRETE MATHEMATICS	2	2	0	0	4	6	NIL	Retained		Employability	The basic course helps better employment
15	BSC	25MT2019	PROBABILITY AND STATISTICS	2	2	0	0	4	6	MFC	Retained		Employability	The basic course helps better employment
16	BSC	25MT2004	MATHEMATICAL OPTIMIZATION	2	2	0	0	4	6	MFE	Retained		Employability	The course helps better employment
17	BSC	25PH1005	ENGINEERING PHYSICS	3	0	2	0	4	6	Nil	Retained			
18	BSC	25CY1001	ENGINEERING CHEMISTRY	3	0	2	0	4	6	NIL	Retained			
		Total		14	8	4	0	24	26					
19	ESC	25SC1101	PROBLEM SOLVING THROUGH C	3	0	2	4	5	9	Nil	new	Industry Personal	Skill development	Enhancing problem-solving skills for students
20	ESC	25SC2006	OBJECT ORIENTED PROGRAMMING	3	0	2	2	4.5	7	PSTC	new		Skill development	Enhancing problem-solving skills and coding for students
21	ESC	25SC1203	DATA STRUCTURES	3	0	2	4	5	9	PSTC	Retained		Skill development	Enhancing problem-solving skills and coding for students



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22	ESC	25SC2007	PYTHON PROGRAMMING	2	0	2	0	3	4	PSTC	new		Skill development	
23	ESC	23ME1103	DESIGN TOOL WORKSHOP	0	0	4	0	2	4	Nil	Retained		Skill development	
24	ESC	25EC1203	FUNDAMENTALS OF IOT AND SENSORS	2	0	2	0	3	4	Nil	Retained		Skill development	
25	ESC	25EC1102	DIGITAL SYSTEM DESIGN	3	0	2	0	4	5	25EC1102	new			
26	ESC	25EC1101	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	3	0	2	0	4	5	Nil	Retained			
Total				19	0	18	10	30.5	47					
27	PCC	25EC2106	PROCESSORS AND CONTROLLERS	3	0	2	0	4	5	COA	Retained		employability	Students attain better employment
28	PCC	25EC2210	NETWORK PROTOCOLS AND SECURITY	3	0	2	0	4	5	DDCA	Retained		employability	Students attain better employment
29	PCC	25IN2101	IOT SYSTEM DESIGN	3	0	2	0	4	5	FIOT &S	Retained		employability	Students attain better employment opportunities as IoT engineers.
30	PCC	25AD2001	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	3	0	2	0	4	5	LACFE	Retained		employability	Students attain better employment opportunities
31	PCC	25EC2107	ANALOG ELECTRONIC CIRCUIT DESIGN	3	0	2	2	4.5	7	BEEC	Retained		employability	Students attain better employment



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														opportunities as IoT engineers.
32	PCC	25AD2103	DATABASE MANAGEMENT SYSTEMS	3	0	2	0	4	5	PSTC	Retained		employability	Students attain better employment opportunities as data base administrators
33	PCC	25EC1204	COMPUTER ORGANIZATION AND ARCHITECTURE	3	0	0	0	3	3	BEC	Retained		employability	Students attain better employment opportunities as IoT engineers.
34	PCC	25IN3103	REALTIME OPERATING SYSTEMS	3	0	2	0	4	5	COA	Retained		employability	Students attain better employment opportunities as IoT engineers.
35	PCC	25IN3204	WIRELESS TECHNOLOGIES FOR INTERNET OF THINGS (WTIoT)	3	0	2	0	4	5	LACE	Retained		employability	Students attain better employment opportunities as IoT engineers.
36	PCC	25IN2202	EMBEDDED SYSTEMS DESIGN	2	0	2	0	3	4	PC	Retained		employability	Students attain better employment opportunities as IoT engineers.
			Total	30	0	18	4	40	52					
37	PCC		FLEXI CORE-1	2	0	2	0	3	4	Nil				
38	PCC		FLEXI CORE-2	2	0	2	0	3	4	Nil				
			Total	4	0	4	0	6	8					
39	PE	PE-1	PROFESSIONAL ELECTIVE - 1	3	0	2	0	4	5	-				



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40	PE	PE-2	PROFESSIONAL ELECTIVE - 2	3	0	0	0	3	3	-				
41	PE	PE-3	PROFESSIONAL ELECTIVE - 3	3	0	0	2	3.5	5	-				
42	PE	PE-4	PROFESSIONAL ELECTIVE - 4	3	0	0	0	3	3	-				
43	PE	PE-4	PROFESSIONAL ELECTIVE - 5	3	0	0	0	3	3					
		Total		15	0	2	2	16.5	19					
53	SDC	25SDIN01	IOT HARDWARE PROGRAMMING	1	0	0	4	2	5	FITS	Retained		Skill development	Students attain better employment opportunities as IoT engineers.
54	SDC	25SDIN02	IOT FULL STACK DEVELOPMENT	1	0	0	4	2	5	IOTH P	Retained		Skill development	Students attain better employment opportunities as IoT engineers and web engineers
55	SDC	25SDIN03	CLOUD COMPUTING FOR IOT	1	0	0	4	2	5	Nil	Retained		Skill development	Students attain better employment opportunities as IoT Engineer , cloud architect
56			SPECIALIZATION	1	0	0	4	2	5					
		TOTAL		0	4	0	0	16	8	20				
57	PRI	25IE2040	SOCIAL INTERNSHIP	0	0	0	4	0	4	Nil	Retained		Skill development	Students attain better employment



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58	PRI	25IE2041	TECHNICAL INTERNSHIP	0	0	0	8	0	8	Nil	Retained		Skill developme nt	Students attain better employment
59	PRI	25IE4053	ENGINEERING CAPSTONE PROJECT - 1	0	0	8	16	8	12	Nil	Retained		Skill developme nt	Students attain better employment
60	PRI	25IE4054	ENGINEERING CAPSTONE PROJECT - 2	0	0	8	16	8	12	Nil	Retained		Skill developme nt	Students attain better employment
61	PRI	25IE4051	INTERNSHIP-1							Nil	Retained		Skill developme nt	Students attain better employment
62	PRI	25IE4052	INTERNSHIP-2							Nil	Retained		Skill developme nt	Students attain better employment
63	PRI	25IE4042	INTERNSHIP							Nil	Retained		Skill developme nt	Students attain better employment
63	PRI	25IE4048	ENGINEERING PROJECT							Nil	Retained		Skill developme nt	Students attain better employment
65	PRI	22IE4042	INDUSTRIAL INTERNSHIP	0	0	0	24	0	24	Nil	Retained		Skill developme nt	Students attain better employment
66	hon or		EMBEDDED LINUX	3	0	2	0	4	5	IOTS D	new	Exte rnal BO S me mbe r	employabil ity	Students attain better employment



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67	Hon or		IOT EDGE COMPUTING	3	0	2	0	4	5	DIIoT S	new	Extel nal BO S me mbe r	employabil ity	Students attain better employment
68	Hon or		GENERATIVE AI	3	0	2	0	4	5	AIML	NEW	Extel nal BO S me mbe r	employabil ity	Students attain better employment
69	hon or		BLOCKCHAIN TECHNOLOGY FOR IOT	3	0	2	0	4	5	NPS	NEW	Extel nal BO S me mbe r	employabil ity	Students attain better employment
70	hon or		DATA VISUALIZATION AND ANALYTICS	3	0	2	0	4	5	DBMS	retain		employabil ity	Students attain better employment
71	hon or		DEEP LEARNING WITH COMPUTER VISION	3	0	2	0	4	5	AIML	retain		employabil ity	Students attain better employment
	Total			0	0	22	80	14	60					
68	OE	OE	OPEN ELECTIVE-1	3	0	0	0	3	3	Nil				
69	OE	OE	OPEN ELECTIVE-2	3	0	0	0	3	3	Nil				
70	OE	OE	OPEN ELECTIVE-3	3	0	0	0	3	3	Nil				



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		Total	9	0	0	0	9	9					
71	VA C		0	0	0	8	0	0	N/A				
72	VA C		0	0	0	8	0	0	N/A				
73	VA C		0	0	0	8	0	0	N/A				
76	VA C		0	0	0	8	0	0	N/A				
		Total	0	0	0	48	0	0					
Total Credits							166						

No of courses previsioned by syllabus : 0

No new courses Introduced: 9

Percentage of syllabus revision: 11%

Percentage of Courses focusing on Employability: 43%

Percentage of Courses focusing on Entrepreneurship: 5%

Percentage of Courses focusing on Skill Development: 25%

Annexures :2.1

Syllabus

COURSE CODE		COURSE CATEGORY			Honors		
COURSE TITLE	IOT EDGE COMPUTING	L	T	P	S	Cr	CH
		3	0	2	2	4.5	7
Pre-Requisite Course(s)	Fundamentals of IoT and sensors	Course Offering Department			IoT		

COURSE OBJECTIVES:

1. Introduce the concepts, architectures, and protocols of edge computing and demonstrate its role in enabling real-time, low-latency IoT applications.
2. To provide hands-on experience in designing and deploying IoT applications on edge devices and integrating AI/ML models, communication protocols, and security mechanisms.

COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand cloud limitations in latency/RTT and explain edge computing architectures and applications.	PO1,PO2,PSO1	2
CO-2	Apply distributed systems and implement AI solutions on edge using TensorFlow Lite.	PO1,PO3,PSO1	3
CO-3	Apply IoT-Edge integration using Docker, Kubernetes, key-value stores, MQTT/Kafka for M2M/WSN edge analytics.	PO1,PO3,PO5,POS1	3
CO-4	Apply ML techniques on edge sensor data for predictive maintenance, image classification, and self-driving cars using	PO1,PO3,PO5,POS1	3
CO-5	Design and deploy edge computing solutions using IoT devices, Docker/Kubernetes, and TensorFlow Lite for real-time AI/ML applications.	PO1,PO3,PO5,POS2	4

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	3	3	-	-	-	-	-	-	-	-	-	1	-
CO-2	3	-	3	-	-	-	-	-	-	-	-	1	-
CO-3	3	-	3	-	3	-	-	-	-	-	-	3	-
CO-4	3	-	3	-	3	-	-	-	-	-	-	3	-
CO-5	3	-	3	-	3	-	-	-	-	-	-	-	3
Average	3	1	3		2.4							2.2	1

SYLLABUS:

CO-1	Introduction to Cloud and its Limitations to Support Low Latency and RTT, Cloud to Edge Computing: Waves of Innovation. Edge Computing Architectures, Support User Applications (5G-Slicing, Self-Driving Cars and More).
CO-2	Concepts of Distributed Systems in Edge Computing, Edge Data Centers, Lightweight Edge Clouds, and Services by Different Providers. AI and TensorFlow Lite: Model Development and Optimization.
CO-3	IoT and Edge Integration, Docker Containers and Kubernetes in Edge Computing. Design of Edge Storage Systems like Key-Value Stores, MQTT and Kafka for End-to-End Edge Pipeline, Edge Analytics Topologies for M2M and WSN Networks (MQTT).
CO-4	Use cases of machine learning for edge sensor data in predictive maintenance, image classifier and self-driving cars. Deep Learning On-Device inference at the edge to support latency-based application, Real-Time Applications with TensorFlow Lite & Case Studies.

TEXTBOOKS:

1	Rajkumar Buyya, "Fog and Edge Computing: Principles and Paradigms", Wiley, 2020
2	Satyanarayanan M., "The Emergence of Edge Computing", Computer, IEEE, 2017.
3	Gaurav Arora, Ed Price, "Hands-On Edge Analytics with Azure IoT", Packt, 2020.

REFERENCE BOOKS:

1	Pethuru Raj, Anupama Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
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2	Mark Daoust, "Edge AI: Convergence of Edge Computing and Artificial Intelligence", Packt, 2021
3	Klaus Hadinger, "TensorFlow Lite for Microcontrollers", O'Reilly, 2021.

MOOCS/WEB LINKS:

1	edX – Introduction to Edge Computing
2	Udemy – Edge Computing with Kubernetes & Docker
3	NPTEL – Cloud Computing (for foundational concepts)

COURSE CODE		COURSE CATEGORY			Honors		
COURSE TITLE	EMBEDDED LINUX	L	T	P	S	Cr	CH
		3	0	2	0	4	5
Pre-Requisite Course(s)	P&C	Course Offering Department			IoT		

COURSE OBJECTIVES:

1. Provide foundational knowledge of embedded systems, including their architecture, characteristics, and the role of open-source platforms, operating systems, and toolchains in embedded software development.
2. To enable students to understand and implement key embedded Linux components, such as bootloaders (e.g., U-Boot), root file systems (e.g., BusyBox), kernel configurations, and device drivers.
3. To develop the ability to design, develop, and optimize embedded applications, focusing on system calls, hardware interfacing, cross-compilation, performance tuning, and real-time system behavior.

COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand the role of open-source tools and platforms in embedded development and identify appropriate choices for system design.	PO1, PO2, PO5/ PSO1, PSO2	2
CO-2	Demonstrate the ability to configure and set up an embedded Linux development environment, including bootloader and root file system construction.	PO1, PO3, PO5/ PSO1, PSO2	3
CO-3	Analyze the structure and components of the Embedded Linux kernel and illustrate the basics of Linux device drivers.	PO1, PO3, PO4/ PSO1	4
CO-4	Develop and optimize embedded applications for performance and resource efficiency in constrained environments.	PO1, PO3, PO5, PSO1	3
CO-5	Configure an embedded Linux environment using cross-compilation and U-Boot, build minimal root file systems, develop device drivers and applications, and optimize for real-time performance.	PO1, PO2, PO3, PO5/ PSO1,	3

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	3	2	-	-	2	-	-	-	-	-	-	2	-
CO-2	3	-	3	-	2	-	-	-	-	-	-	2	-
CO-3	3	-	2	2	-	-	-	-	-	-	-	2	-
CO-4	3	-	3	-	2	-	-	-	-	-	-	2	-
CO-5	3	2	3	-	3	-	-	-	-	-	-	3	-
Average	3	2	2.75	2	2.25	-	-	-	-	-	-	2.2	-

SYLLABUS:

CO-1	Introduction to Embedded Systems and Open Source: Embedded systems overview and characteristics, Role of open-source software in embedded development, Popular open-source platforms and communities. Choice-Points in Embedded Development: Selection criteria for embedded OS, toolchains, and hardware, Comparison of embedded Linux vs. RTOS, Setting Up Embedded Development Environment Introduction to cross-compilation and toolchains
CO-2	Bootloader Concepts: Bootloader basics and its role in embedded systems, Overview of U-Boot: configuration, compilation, flashing, Boot sequence in embedded Linux. Building the Root File System: Understanding root filesystem structure, creating minimal rootfs (Busy Box, init system), Mounting file systems on target, Adding applications and libraries, File system types, Flash storage management.
CO-3	Embedded Linux Kernel – Components and Configuration: Kernel architecture for embedded systems, Configuring and building the Linux kernel, Device tree concepts Introduction to Linux Device Drivers: Kernel space vs. user space, Types of device drivers, Simple character device driver example.
CO-4	Embedded Application Development: Application development using system calls and libraries, Interfacing with hardware, Cross-compiling and deploying applications. Application Optimization Techniques: Code size and memory footprint reduction, Power optimization strategies, Real-time considerations and performance tuning
CO-5	Set up an embedded Linux development environment using cross-compilation tools and configure bootloaders like U-Boot for target hardware. Build and deploy minimal root file systems, develop and test Linux device drivers and applications, and demonstrate real-time performance optimization techniques.



TEXTBOOKS:

1	Hallinan, C. (2011). Embedded Linux primer: A practical real-world approach (2nd ed.). Pearson Education.
2	Abbott, D. (2017). Linux for embedded and real-time applications (4th ed.). Newness.
3	Vasquez, F., & Simmonds, C. (2021). Mastering embedded Linux programming (3rd ed.). Packt Publishing.

REFERENCE BOOKS:

1	Venkateswaran, S. (2008). Essential Linux device drivers. Prentice Hall.
2	Yaghmour, K. (2008). Building embedded Linux systems (2nd ed.). O'Reilly Media.
3	Valvano, J. W. (2015). Embedded systems: Introduction to the MSP432 microcontroller (1st ed.). CreateSpace Independent Publishing Platform

MOOCS/WEB LINKS:

1	The Linux Foundation. (n.d.). Embedded Linux development training. Linux Foundation.://training.linuxfoundation.org/training/embedded-linux-development/
2	University of Colorado Boulder. (n.d.). Introduction to embedded systems software and development environments [MOOC]. Coursera. https://www.coursera.org/learn/introduction-embedded-systems
3	The University of Texas at Austin. (n.d.). Embedded systems - shape the world [MOOC]. edX. https://www.edx.org/course/embedded-systems-shape-the-world
4	Bootlin. (n.d.). Embedded Linux training materials. Bootlin. https://bootlin.com/doc/training/embedded-linux/
5	BusyBox. (n.d.). BusyBox: The Swiss Army Knife of Embedded Linux. https://busybox.net/
6	The Linux Foundation. (n.d.). Embedded Linux development training. Linux Foundation.://training.linuxfoundation.org/training/embedded-linux-development/



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COURSE CODE		COURSE CATEGORY			Honors		
COURSE TITLE	Block chain Technology for IoT	L	T	P	S	Cr	CH
		3	0	2	0	4	5
Pre-Requisite Course(s)	NIL	Course Offering Department			IOT		

COURSE OBJECTIVES:

- To analyze how blockchain enhances security, privacy, and trust in IoT systems.
- Design blockchain-IoT architectures with efficient data and identity management.
- To develop smart contracts for decentralized IoT applications.
- Implementation of secure and privacy-preserving blockchain-based IoT solutions.

COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand and apply the fundamental concepts of blockchain and IoT architectures	PO2, PO3, PSO2	3
CO-2	Analyze IoT security challenges and explain how blockchain can address them.	PO2, PO3, PSO2	4
CO-3	Apply blockchain-IoT integration concepts to implement on-chain/off-chain data models, communication frameworks, middleware solutions, and blockchain-based device identity management.	PO2, PO3, PSO2	3
CO-4	Demonstrate the use of smart contracts to enable decentralized IoT applications	PO2, PO3, PO4, PSO2	4
CO-5	Apply blockchain solutions to real-world IoT problems in domains such as healthcare, supply chain, and smart cities.	PO2, PO3, PO5, PSO2	3

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	-	2	2	-	-	-	-	-	-	-	-	-	2
CO-2	-	2	2	-	-	-	-	-	-	-	-	-	2
CO-3	-	2	2	-	-	-	-	-	-	-	-	-	2
CO-4	-	2	2	1	-	-	-	-	-	-	-	-	2
CO-5	-	2	2		1	-	-	-	-	-	-	-	2
Average	-	2	2	1	-	-	-	-	-	-	-	-	2

SYLLABUS:

CO-1	Introduction to Blockchain and IoT: IoT Architecture and Challenges, Blockchain Technology Overview, Synergies between Blockchain and IoT, Applications of Blockchain in IoT (e.g., Smart Homes, Supply Chain)
CO-2	Blockchain Fundamentals: Blocks, Hashes, Merkle Trees, Consensus Mechanisms: PoW, PoS, DPoS, PBFT, Smart Contracts, Blockchain Types: Public, Private, Consortium
CO-3	Blockchain-IoT Integration Architecture: On-chain vs Off-chain IoT data, Blockchain-IoT Communication Models, Middleware Solutions, Device Identity Management using Blockchain.
CO-4	Smart Contracts for IoT: Writing Smart Contracts in Solidity, IoT Data Triggered Contracts, Decentralized Access Control, Oracles for IoT Integration. Security and Privacy in Blockchain-IoT: IoT Security Challenges, Blockchain for Data Integrity and Privacy, Decentralized Authentication, Use of IPFS for IoT Data Storage. Applications and Case Studies: Smart Cities, e-Healthcare, Smart Grid, Blockchain in Industrial IoT (IIoT), Case Studies: IBM Watson, IOTA, VeChain, Modum, Future Research and Open Challenges
CO-5	Plakadot, hyperledger fabric, IoTchain, Truffle, IoTvity, Solidity

TEXTBOOKS:

1	"Blockchain Technology and Applications" – by Neel Mehta, Aditya Agashe, Parth Detroja
2	"Blockchain for IoT" – by Bellaj Badr, Richard Horrocks, Xun (Brian) Wu



REFERENCE BOOKS:

1	"Blockchain Basics" – Daniel Drescher
2	"Building Blockchain Projects" – Narayan Prusty
3	"Architecting the Internet of Things" – Dieter Uckelmann et al

MOOCS/WEB LINKS:

1	Blockchain and IoT – <i>Udemy</i>
2	IoT and Blockchain Specialization – <i>Coursera (Offered by University of Colorado)</i>
3	Ethereum and Solidity: The Complete Developer's Guide – <i>Udemy</i>

COURSE CODE		COURSE CATEGORY			Honours		
COURSE TITLE	Generative AI	L	T	P	S	Cr	CH
		3	0	2	0	4	5
Pre-Requisite Course(s)	AIML	Course Offering Department			IOT		

COURSE OBJECTIVES:

1. **Introduce the principles and architectures of Generative AI models**, such as GANs, VAEs, Diffusion Models, and Large Language Models.
2. **To provide hands-on experience in designing and applying generative models** for tasks such as image synthesis, text generation, and data augmentation.

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand the Generative AI models	PO2, PO3, PSO2	3
CO-2	Enhance analytical skills with generative AI capabilities.	PO2, PO3,	4
CO-3	Develop skills to leverage trust and fairness in building Generative AI systems	PO2, PO3, PSO2	3



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CO-4	Analyze how to Create real-life case studies for Generative AI frameworks in different scenarios.	PO2, PO3, PO4, PSO2	4
CO-5	Implement generative AI models with different case studies using python	PO2, PO3, PO5, PSO2	3

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	-	2	2	-	-	-	-	-	-	-	-	-	2
CO-2	-	3	2	-	-	-	-	-	-	-	-	-	2
CO-3	-	2	2	-	-	-	-	-	-	-	-	-	2
CO-4	-	2	2	1	-	-	-	-	-	-	-	-	2
CO-5	-	2	2		1	-	-	-	-	-	-	-	2
Average	-	2	2	1	-	-	-	-	-	-	-	-	2

SYLLABUS:

CO-1	Understand the fundamentals of Generative AI, including key models (VAEs, LLMs, GPT variants), their architectures, and applications across various domains. (Mapped from: Introduction, Generative Models, VAEs, LLMs, GPT & ChatGPT basics)
CO-2	prompt engineering techniques and strategies to design effective prompts, control model behavior, and improve the performance of large language models.(Mapped from: Prompt Engineering, Prompt Designing, Output Control, OpenAI tools)
CO-3	advanced frameworks and tools such as LangChain and RAG models for developing applications that integrate embeddings, vector databases, and multi-modal generative capabilities. (Mapped from: LangChain, Embeddings, Indexing, RAG Models, Text-to-Image, Multimodal AI)
CO-4	ethical considerations, challenges, and real-world use cases of Generative AI, focusing on fairness, bias mitigation, and responsible deployment in diverse application areas.(Mapped from: Ethics, Bias, Fairness, Responsible AI, Generative AI Use Cases)
CO-5	TensorFlow, PyTorch, Hugging Face, LangChain, and OpenAI APIs, and evaluate their performance across text, code, image, audio, and video generation tasks.

TEXTBOOKS:

1	Goodfellow, Y. Bengio, and A. Courville, Deep Learning, MIT Press, 2016.
2	Numa Dhamani and Maggie Engler, Introduction to Generative AI, Second Edition, June 2025, ISBN 9781633434882.

REFERENCE BOOKS:

1	"Generative AI for everyone: Understanding the essentials and applications of this breakthrough technology", Altaf Rehmani .
2	Introduction to Generative AI", Numa Dhamani, Kindle Edition, 2024
3	Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.

MOOCS/WEB LINKS:

1	https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-courses/?v=c86ee0d9d7ed
2	https://www.coursera.org/learn/generative-ai-for-everyone
3	https://www.coursera.org/learn/generative-ai-with-llms

Annexure :3

PROGRAM STRUCTURE FOR B. TECH IOT (Y24 REGULATION)								
Type	course code	Course Title	L	T	P	S	CR	C H
AUC	24UC0017	INDIAN ANCIENT KNOWLEDGE SYSTEMS : VEDIC MATHEMATICS	2	0	0	0	0	2
AUC	24UC0032	SUSTAINABLE DEVELOPMENT GOALS	2	0	0	0	0	2
AUC	23UC0008	INDIAN CONSTITUTION	2	0	0	0	0	2
AUC	23UC0009	ECOLOGY AND ENVIRONMENT	2	0	0	0	0	2
AUC	23UC0013	GLOBAL LOGIC BUILDING CONTEST PRACTICUM	0	0	0	2	0	2
AUC	23UC0014	GLOBAL LOGIC BUILDING CONTEST PRACTICUM	0	0	0	2	0	2
		No of audit course is completed :4	8	0	0	0	0	8
BRIDGE	23UC0018	FUNDAMENTALS OF MATHEMATICS (BIPC)	3	0	0	0	0	3
			3	0	0	0	0	3



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BSC	23MT1001	LINEAR ALGEBRA AND CALCULUS FOR ENGINEERS	2	2	0	0	4	4
BSC	24MT1002	DISCRETE MATHEMATICS	2	2	0	0	4	4
BSC	24MT2019	PROBABILITY AND STATISTICS	2	2	0	0	4	4
BSC	24MT2004	MATHEMATICAL OPTIMIZATION	2	2	0	0	4	4
BSC	24PH1005	SCIENCE ELECTIVE -1 (ENGINEERING PHYSICS)	3	0	2	0	4	5
BSC	23CY1001	SCIENCE ELECTIVE -2 (ENGINEERING CHEMISTRY)	3	0	2	0	4	5
		NO OF CREDITS TO BE COMPLETED	14	8	4	0	24	26
ESC	23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	2	0	0	0	2	2
ESC	23SC1101	COMPUTATIONAL THINKING FOR STRUCTURED DESIGN	3	0	2	4	5	9
ESC	23EC1202	DIGITAL DESIGN AND COMPUTER ARCHITECTURE	3	0	2	0	4	5
ESC	23EC1101	FUNDAMENTALS OF IOT AND SENSORS	2	0	4	0	4	6
ESC	24SC1203	DATA STRUCTURES	3	0	2	4	5	9
ESC	23ME1103	DESIGN TOOLS WORKSHOP	0	0	4	0	2	4
ESC	24SC2006	OBJECT ORIENTED PROGRAMMING	3	0	2	2	4.5	7
		NO OF CREDITS TO BE COMPLETED	16	0	16	10	26.5	42
HAS	24UC1203	DESIGN THINKING AND INNOVATION	2	0	2	0	3	4
HAS	24UC1102	LANGUAGE SKILLS FOR ENGINEERS	0	0	4	0	2	4
HAS	24UC1204	COMMUNICATION SKILLS FOR ENGINEERS	0	0	4	0	2	4
HAS		MANAGEMENT ELECTIVE	3	0	0	0	3	3
HAS		FOREIGN LANGUAGE	3	0	0	0	3	3
HAS	23UC0026	HUMAN VALUES, GENDER EQUALITY AND PROFESSIONAL ETHICS	2	0	0	0	2	2
SIL	22UC0021	SOCIAL IMMERSIVE LEARNING-1	0	0	2	0	1	2
SIL	22UC0022	SOCIAL IMMERSIVE LEARNING-2	0	0	2	0	1	2
		TOTAL NO OF CREDITS TO BE COMPLETED	10	0	14	0	17	24
PCC	24AD2002	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	3	0	2	0	4	5
PCC	24AD2104	DATABASE MANAGEMENT SYSTEMS	3	0	2	0	4	5
PCC	24EC2104	ANALOG ELECTRONIC CIRCUIT DESIGN	3	0	2	2	4.5	7



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PCC	24EC2106	PROCESSORS AND CONTROLLERS	3	0	2	0	4	5
PCC	24EC2210	NETWORK PROTOCOLS AND SECURITY	3	0	2	0	4	5
PCC	24IN2101	IOT SYSTEM DESIGN	3	0	2	0	4	5
PCC	24IN3204	WIRELESS TECHNOLOGIES FOR IOT	3	0	2	0	4	5
PCC	22IN2202	EMBEDDED SYSTEM DESIGN	3	0	2	0	4	5
PCC	24IN3103	REAL TIME OPERATING SYSTEMS	3	0	2	2	4.5	7
		TOTAL NO OF CREDITS TO BE COMPLETED	27	0	18	4	37	49
FCC		FLEXI CORE-1	2	0	2	0	3	4
FCC		FLEXI CORE-2	2	0	2	0	3	4
		TOTAL NO OF CREDITS TO BE COMPLETED	4	0	4	0	6	8
SDC	24SDIN01	IOT HARDWARE PROGRAMMING	1	0	0	4	2	5
SDC	24SDIN02	IOT FULL STACK DEVELOPMENT	1	0	0	4	2	5
SDC	24SDIN03	CLOUD COMPUTING FOR IOT	1	0	0	4	2	5
SDP-4	24SDIN04	IoT ANALYTICS FOR CLOUD(Specialization)	1	0	0	4	2	5
		TOTAL NO OF CREDITS TO BE COMPLETED	4	0	0	16	8	20
PEC		PROFESSIONAL ELECTIVE-1	3	0	2	0	4	5
PEC		PROFESSIONAL ELECTIVE-2	3	0	0	0	3	3
PEC		PROFESSIONAL ELECTIVE-3	3	0	0	2	3.5	5
PEC		PROFESSIONAL ELECTIVE-4	3	0	0	0	3	3
PEC		PROFESSIONAL ELECTIVE-5	3	0	0	0	3	3
		TOTAL NO OF CREDITS TO BE COMPLETED	15	0	2	2	16.5	19
PRI	24IE2040	SOCIAL INTERNSHIP	0	0	0	4	0	4
PRI	24IE2041	TECHNICAL INTERNSHIP	0	0	0	4	0	4
PRI	24IE4053	ENGINEERING CAPSTONE PROJECT - 1/PS/I	0	0	8	16	8	12
PRI	24IE4054	ENGINEERING CAPSTONE PROJECT - 2/PS/I	0	0	8	16	8	12
		NO OF CREDITS TO BE COMPLETED	0	0	16	40	16	32
OEC		OPEN ELECTIVE - 1	3	0	0	0	3	3
OEC		OPEN ELECTIVE - 2	3	0	0	0	3	3
OEC		OPEN ELECTIVE - 3	3	0	0	0	3	3
		TOTAL NO OF CREDITS TO BE COMPLETED	9	0	0	0	9	9
SPORT		SPORTS / YOGA CERTIFICATION	0	0	0	2	0	2
VAC		VALUE ADDED COURSE -1	0	0	0	2	0	2
VAC		VALUE ADDED COURSE -2	0	0	0	2	0	2
VAC		VALUE ADDED COURSE -3	0	0	0	2	0	2



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		NO OF COURSES TO BE COMPLETED :4	0	0	0	8	0	8
		TOTAL					160	23 2



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HONORS COURSES

Sl No	category	SEM.	Course Code	Course Title	L	T	P	S	Cr	CH
1	HFC	2-1Sem	24IN02HF	EMBEDDED LINUX	3	0	2	0	4	5
2	HFC	2-2Sem	24IN01HF	IOT EDGE COMPUTING	3	0	2	0	4	5
3	HFC	3-1Sem	24IN03HF	DATA VISUALIZATION AND ANALYTICS	3	0	2	0	4	5
3	HFC	3-1Sem	24IN04HF	DEEP LEARNING WITH COMPUTER VISION	3	0	2	0	4	5
4	HFC	3-2Sem	24IN05HF	GENERATIVE AI	3	0	2	0	4	5
5	HFC	4-1Sem	24IN06HF	BLOCKCHAIN TECHNOLOGY FOR IOT	3	0	2	0	4	5
				TOTAL					20	
1	HTI	2-1Sem	24DT01IF	ENTREPRENEURIAL TECHNOLOGY DEVELOPMENT AND PROTOTYPING	3	0	2	0	4	5
2	HTI	2-2Sem	24DT02IF	PROBLEM DEFINITION AND VALIDATION	3	0	2	0	4	5
3	HTI	3-1Sem	24DT03IF	PRODUCT DESIGN AND PROTOTYPE VALIDATION	3	0	2	0	4	5
4	HTI	3-2Sem	24DT04IF	SCALABLE SOLUTION DEVELOPMENT	3	0	2	0	4	5
1	HTR	2-1Sem	24IE01RF	INDEPENDENT STUDY & RESEARCH	3	0	2	0	4	5
2	HTR	2-2Sem	24IE02RF	RESEARCH METHODOLOGY, ETHICS & SCIENTIFIC WRITING	3	0	2	0	4	5
3	HTR	3-1Sem	24IE03RF	RESEARCH SEMINAR	3	0	2	0	4	5
4	HTR	3-2Sem	24IE04RF	TERM PAPER	3	0	2	0	4	5

Double Major courses

Sl No	CATEGORY	NPTEL - DOMA IN NAME	Course Title	AC R O NY M	M o d e	L	T	P	S	Cr	C H	PRE-REQ UISE	SE ME ST ER
1	DOUBLE MAJOR	Major Speciali zation: IOT	INTRODUCTION TO INTERNET OF THINGS	IIO T	R / E	4	0	0	0	4	4	NIL	3
2	DOUBLE MAJOR	Major Speciali	INTRODUCTION TO EMBEDDED SYSTEM DESIGN	IO TE S	R / E	4	0	0	0	4	4	FIS	3



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		zation: IOT											
3	DOUBLE MAJOR	Major Speciali- zation: IOT	INTERNET OF THINGS: DESIGN CONCEPTS AND USE CASES	IO TC T	R / E	4	0	0	0	4	4	FIS	4
4	DOUBLE MAJOR	Major Speciali- zation: IOT	FOUNDATION OF CLOUD IOT EDGE ML	FC IO TE M L	R / E	4	0	0	0	4	4	FIS	5
5	DOUBLE MAJOR	Major Speciali- zation: IOT	CLOUD COMPUTING AND DISTRIBUTED SYSTEMS FOR IOT	CC DS IO T	R / E	4	0	0	0	4	4	FIS	5
6	DOUBLE MAJOR	Major Speciali- zation: IOT	DESIGN FOR INTERNET OF THINGS	DII OT ES	R / E	4	0	0	0	4	4	FIS	6
7	DOUBLE MAJOR	Major Speciali- zation: IOT	WIRELESS AD HOC AND SENSOR NETWORKS	W AS N	R / E	4	0	0	0	4	4	FIS	7
8	DOUBLE MAJOR	Major Speciali- zation: IOT	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	III OT	R / E	4	0	0	0	4	4	FIS	6
9	DOUBLE MAJOR	Major Speciali- zation: IOT	COMPONENTS AND APPLICATIONS OF INTERNET OF THINGS	CA IO T	R / E	4	0	0	0	4	4	FIS	5
10	DOUBLE MAJOR	Major Speciali- zation: IOT	CLOUD COMPUTING	CC	R / E	4	0	0	0	4	4	NIL	3

ANNEXURE 3.1

SYLLABUS

COURSE CODE		COURSE CATEGORY			SDC		
COURSE TITLE	CLOUD COMPUTING FOR IOT	L	T	P	S	Cr	CH
		1	0	0	4	2	5
Pre-Requisite Course(s)	FIS	Course Offering Department			IOT		

COURSE OBJECTIVES:

1. Introduce students to the integration of Cloud Computing and the Internet of Things (IoT), emphasizing architecture, platforms, and real-world applications in areas such as smart cities, healthcare, and industry.
2. To develop students' practical skills in implementing cloud-enabled IoT systems, focusing on data management, storage, analytics, security, and the use of platforms such as AWS, Azure, and Google Cloud to build scalable and secure IoT solutions.

COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Apply the concepts of cloud computing services to implement IoT applications.	PO1, PO2/PSO1	3
CO-2	Apply various cloud infrastructure, virtualization, and storage services to store sensor data.	PO1, PO2/PSO1	3
CO-3	Develop IoT applications using cloud-based IoT platforms.	PO1, PO2, PO3/PSO1	3

SYLLABUS:



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CO-1	Introduction to Cloud Computing and IoT: Introduction to Cloud Computing, Synergy between IoT and Cloud Computing: Case studies: Smart cities, healthcare, and industrial IoT. Challenges of IoT data management without cloud infrastructure. IoT Architectures and Cloud Integration: Cloud-based IoT architectures: Centralized vs. edge/fog computing. Role of cloud in IoT: Data storage, computation
CO-2	Cloud Computing Fundamentals for IoT: Cloud Service Virtual machines, containers (Docker), and hypervisors. Cloud providers for IoT: AWS IoT Core, Azure IoT Hub, Google Cloud IoT. Connect a Raspberry Pi or ESP32 to a cloud platform and send sensor data.
CO-3	Cloud Storage and Data Management for IoT: IoT data characteristics, Cloud storage solutions Data migration techniques from IoT devices to the cloud. Store IoT sensor data in a cloud database (e.g., AWS S3 or Azure Blob Storage). Analysis. Tools: AWS IoT Analytics or Google Cloud to analyze and visualize IoT data. Security and Privacy in Cloud-IoT Systems. : Cloud-Based IoT Platforms.: AWS IoT Core, Azure IoT Hub, Google Cloud IoT Core. Serverless computing for IoT: AWS Lambda, Azure Functions. Microservices and cloud-native IoT applications. Case Studies

TEXTBOOKS:

1	Cloud Computing a Practical Approach for Learning and Implementation, ", A Srinivasan, J Suresh, 2014, Pearson
2	"Cloud Computing, A Practical Approach", Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, 2009, Tata-McGraw-Hill Osborne Media.
3	"Cloud computing: Data intensive computing and scheduling", Magoules, Frederic, 2019, Chapman & Hall.

REFERENCE BOOKS:

1	Erl, T., Mahmood, Z., & Puttini, R. (2013). Cloud computing: Concepts, technology & architecture. Prentice Hall.
2	Sosinsky, B. (2011). Cloud computing Bible. Wiley.
3	Buyya, R., Vecchiola, C., & Selvi, S. T. (2013). Mastering cloud computing: Foundations and applications programming. Morgan Kaufmann.

MOOCS/WEB LINKS:

1	https://www.youtube.com/watch?v=NzZXz3fJf6olist=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
2	https://www.coursera.org/learn/iot-wireless-cloud-computing
3	https://www.coursera.org/learn/cloudcomputing?specialization=cloud-computing

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	2	2										2	
CO-2	2	2										2	
CO-3	3	3	2								3	3	
Average	2.3	2.3	2								3	2.3	

COURSE CODE		COURSE CATEGORY			PCC		
COURSE TITLE	WIRELESS TECHNOLOGIES FOR IOT	L	T	P	S	Cr	CH
		3	0	2	0	4	5
Pre-Requisite Course(s)	IOT SYSTEM DESIGN	Course Offering Department			IOT		

COURSE OBJECTIVES:

1. To provide a comprehensive understanding of the fundamentals of wireless communication and advanced wireless technologies relevant to IoT.
2. This is similar to the knowledge of modern wireless standards, such as 5G New Radio (5G NR) and Narrowband IoT (NB-IoT), focusing on their protocols, design considerations, and applications in IoT and next-generation networks.

COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand key concepts of wireless communication, including RF analysis, communication types, network factors,	PO1/PSO1	2



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CO-2	Understand the Wireless Sensor and Personal Area Networks (Bluetooth, ZigBee, UWB, and IEEE 802.15/802.11 standards), including key standards, routing, and coexistence strategies.	PO1/PSO1	2
CO-3	Apply 5G-NR concepts and technologies to support massive IoT and various use cases in 5G networks.	PO1, PO11/PSO1	3
CO-4	Apply NB-IoT physical layer concepts to configure and evaluate its performance for 5G applications.	PO1, PO11/PSO1	3
CO-5	Analyze, configure, and evaluate wireless communication systems, sensor networks, 5G NR architectures, and NB-IoT technologies using relevant protocols and standards.	PO1, PO11/PSO1	4

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	2											2	
CO-2	2											2	
CO-3	2										2	2	
CO-4	2										2	2	
CO-5	3										2	3	
Average	2.2										2	2.2	

SYLLABUS:

CO-1	Introduction to Wireless Communications Systems: RF & Spectrum Analysis of RF Environment, communication - Analog and Digital communication. Factors affecting network: range and speed, Environment, Line-of- sight, Interference, Defining CDMA and OFDM.
CO-2	WSN & WPN: Wireless Personal Area Networks, Bluetooth, Bluetooth Standards, Bluetooth Protocol Architecture, UWB, IEEE 802.15 standards, ZigBee, Sensor Networks, co-existence strategies in Sensor Networks, Routing protocols in Wireless Sensor Networks. IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE 802.11 Standards, 802.11-2007, 802.11a/b/g, 802.11e/h/I, 802.11n.
CO-3	Introduction to 5G-NR: Evolution of Cellular system architecture from 2G to 5G. Role of 5G in massive IoT. Frequency bands for new radio, RAN architectures, frame structure, slot

	format, 5G Architecture and Call Process with 3GPP Standards, pillars of 5G, 5G use cases - eMMB, mMTC, URLLC, Service Based Architecture, Network Slicing - Management and orchestration, Protocols – NGAP, HTTP, TLS, PFCP, GTP-U, SCTP, 5G NAS. Dual Connectivity architecture.
CO-4	NB-IoT: Radio access design principles - Low device complexity and cost, Coverage enhancement, long device battery lifetime, Support of massive number of devices, Deployment flexibility, Coexistence with LTE. Physical layer, Frame structure, Resource grid, Transmission schemes, Duplex modes, Downlink operation, Uplink operation, Device categories and capabilities, Downlink physical channels and signals, NB-IoT subframes, Synchronization signals, NRS, NPBCH, NPDCCH, NPDSCH, NPRS, NWUS, Coverage and data rate, Devices configured with two simultaneous HARQ processes. Evaluation assumptions, Latency performance, Battery life, Capacity performance, Positioning, Device complexity, NB-IoT fulfilling 5G performance.

TEXTBOOKS:

1	Willsky, A. S., Nawab, S. H., Oppenheim, A. V. (2015). Signals & Systems. Pearson.
2	Communication Systems, Simon Haykin, 3Rd Ed, Wilwy India Pvt.Limited
3	Mobile and cellular telecommunication, William C.Y. Lee, 2nd Edition, TATA McGRAW-HILL edition.
4	OLOF LIBERG, Marten Sundberg Cellular Internet of Things

REFERENCE BOOKS:

1	H Taub & Schilling, Gautam Sahe,” Principles of Communication Systems”, TMH, 3rd Edition, (2007).
2	A Comprehensive Survey of RAN Architectures Toward 5G Mobile Communication System, Mohammad Asif Habibi, Meysam Nasimi, Bin Han, May 28, 2019, date of current version June 11, 2019.
3	Emerging wireless lans, wireless pans, and wireless mans, yang xiao yi pan, John Wiley & sons, inc., publication, 2009

MOOCS/WEB LINKS:

1	https://www.coursera.org/programs/kl-university-faculty-program-lub63/learn/iot-wireless-cloud-computing?source=search
2	https://onlinecourses.nptel.ac.in/noc21_ee66/preview
3	https://www.coursera.org/programs/kl-university-faculty-program-lub63/learn/wireless-communications?source=search

Annexure-7

Syllabus Revision

1. Program structure (with all Courses) containing the following categorization

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New/Revised/Retained	Stakeholder Category	Justification for considering the feedback
23IN2203	Wireless Technologies for Internet of things	Mandatory	3	0	2	0	4	IoT System Design	Revised	Industry Experts / Academia and Students	Upgrades syllabus from basics to system-level IoT design. Meets industry demand for end-to-end IoT skills. Enhances practical exposure and employability.

Percentage of Syllabus Revision= (Total Number of New Courses+ Total Number of Revised Courses)/total number of courses.

2. Course-wise syllabus revision of approved structure as mentioned in point 1(program structure (with all courses) containing the following categorization).

Course Code	Course Name	Course Category	Existing Syllabus (as per Annexure-3)	New Syllabus (as per Annexure-3)	Topics Added/Removed/Replaced	Change in Outcome	Justification for the Modification	*Overall Revision Percentage
24IN2204	WIRELESS TECHNOLOGIES FOR IOT	Mandatory (PCC)	Introduction to Wireless Communications Systems: RF & Spectrum Analysis of RF Environment, communication - Analog and Digital communication. Factors affecting network: range and speed, Environment, Line-of- sight, Interference,	Introduction to Wireless Communications Systems: RF & Spectrum Analysis of RF Environment, communication - Analog and Digital communication. Factors affecting network: range and speed, Environment, Line-of- sight, Interference, Defining CDMA and OFDM.	NIL	NIL	NA	0%



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			Defining CDMA and OFDM.					
			WSN & WPN: Wireless Personal Area Networks, Bluetooth, Bluetooth Standards, Bluetooth Protocol Architecture, UWB, IEEE 802.15 standards, ZigBee, Sensor Networks, co-existence strategies in Sensor Networks, Routing protocols in Wireless Sensor Networks	WSN & WPN: Wireless Personal Area Networks, Bluetooth, Bluetooth Standards, Bluetooth Protocol Architecture, UWB, IEEE 802.15 standards, ZigBee, Sensor Networks, co-existence strategies in Sensor Networks, Routing protocols in Wireless Sensor Networks. IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE802.11 Standards, 802.11-2007, 802.11a/b/g, 802.11e/h/I, 802.11n.	WLAN QoS & Power-Save, IEEE802.11 Standards, 802.11-2007, 802.11a/b/g, 802.11e/h/I, 802.11n.	Outcome enhanced from Understand the Wireless Sensor and Personal Area Networks (Bluetooth, ZigBee, UWB, and IEEE 802.15/802.11 standards), including key standards, routing, and coexistence strategies.		~20%
			Organizations and Standards: IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE802.11 Standards, 802.11-2007, 802.11a/b/g, 802.11e/h/I, 802.11n. Introduction to wireless sensor Networks – Advantages of ad-hoc/sensor networks, Unique constraints and challenges. Applications, Platforms for WSN.	Introduction to 5G-NR: Evolution of Cellular system architecture from 2G to 5G. Role of 5G in massive IoT. Frequency bands for new radio, RAN architectures, frame structure, slot format, 5G Architecture and Call Process with 3GPP Standards, pillars of 5G, 5G use cases - eMMB, mMTC, URLLC, Service Based Architecture, Network Slicing - Management and orchestration, Protocols – NGAP, HTTP, TLS, PFCP, GTP-U, SCTP, 5G NAS. Dual Connectivity architecture.	Call Process with 3GPP Standards, pillars of 5G, 5G use cases - eMMB, mMTC, URLLC, Service Based Architecture, Network Slicing - Management and orchestration.	Outcome expanded from basic device handling to IoT communication.		~100%



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					ration, Protocols – NGAP, HTTP, TLS, PFCP, GTP-U, SCTP, 5G NAS. Dual Connectivity architecture.			
			Cellular Standards: Cellular carriers and Frequencies, Channel allocation, Cell coverage, Cell Splitting, Microcells, Picocells, Handoff; Evolution of Cellular system architecture from 2G to 5G, Frequency bands for new radio, RAN architectures, frame structure, 5G Core architecture.	NB-IoT: Radio access design principles - Low device complexity and cost, Coverage enhancement, long device battery lifetime, Support of massive number of devices, Deployment flexibility, Coexistence with LTE. Physical layer, Frame structure, Resource grid, Transmission schemes, Duplex modes, Downlink operation, Uplink operation, Device categories and capabilities, Downlink physical channels and signals, NB-IoT subframes, Synchronization signals, NRS, NPBCH, NPDCCH, NPDSCH, NPRS, NWUS, Coverage and data rate, Devices configured with two simultaneous HARQ processes. Evaluation assumptions, Latency performance, Battery life, Capacity	NB-IoT subframes, Synchronization signals, NRS, NPBCH, NPDCCH, NPDSCH, NPRS, NWUS, Coverage and data rate, Device configurations with two simultaneous HARQ processes. Evaluation assumptions	Outcome expanded from basic device handling to IoT communication.		100%



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				performance, Positioning, Device complexity, NB-IoT fulfilling 5G performance.	tions, Latency performance, Battery life, Capacity performance, Positioning, Device complexity, NB-IoT fulfilling 5G performance.			
--	--	--	--	--	---	--	--	--

*Overall Revision Percentage= sum of the percentage of Course Outcome revisions. Any revision to a tune of 25% or above was considered a new course. In all other cases, the course code is changed, and the course is considered revised.

Each CO revision percentage was calculated based on the extent to which the outcome has been revised through the addition or deletion of topics.

COURSE CODE		COURSE CATEGORY			SDC		
COURSE TITLE	IoT Hardware Programming	L	T	P	S	Cr	CH
		1	0	0	4	2	5
Pre-Requisite Course(s)	FIS	Course Offering Department			IoT		

COURSE OBJECTIVES:

1. To introduce students to device-level programming using Embedded C and Arduino C for microcontrollers such as STM32, AVR, and ARM Cortex-M, and to familiarize them with the hardware and functional requirements of IoT sensor nodes, including MCU, sensors, power, connectivity, and memory.



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- To enable students to understand and analyze the design requirements of IoT gateways, including processor types, memory configurations, hardware interfaces, communication protocols, and compatible operating systems.
- To develop skills for designing and integrating sensor nodes using ESP32 and Raspberry Pi, implementing Python-based interfacing with sensors and peripherals, efficiently managing power, and enabling connectivity with cloud platforms.

COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand and implement device-level programming using Embedded C and Arduino C on STM32, AVR, ARM Cortex-M, and ATmega328P microcontrollers; evaluate sensor node requirements including MCU, sensors, power sources, connectivity, memory, and security.	PO1, PO2, PSO1	2
CO-2	Analyze IoT gateway requirements including processor architecture (ARM Cortex-A, x86), memory, storage, interfaces (USB, UART, SPI, I2C, GPIO), connectivity (Ethernet, Wi-Fi, LTE/4G, Zigbee, BLE, RS485/Modbus, LoRa), and OS support (Linux, Android Things, Yocto, Windows IoT Core).	PO1, PO2, PO3, PSO1	4
CO-3	Analyze and develop sensor nodes with ESP32 and Raspberry Pi by interfacing sensors (BME280, DHT11, SPO2), programming GPIOs, integrating camera modules, connecting to cloud, and applying power management techniques using regulators, battery ICs, solar chargers, and sleep modes.	PO1, PO2, PO3, PO5, PSO1	4

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	3	3	-	-	-	-	-	-	-	-	-	3	-
CO-2	3	2	1	-	-	-	-	-	-	-	-	3	-
CO-3	3	2	1	-	3	-	-	-	-	-	-	3	-

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Average	3	2.33	1	-	3	-	-	-	-	-	-	3	-

SYLLABUS:

CO-1	Device-Level Programming: Languages, Embedded C, Used for STM32, AVR, ARM Cortex-M, Arduino C: Used for quick prototyping with Arduino boards, Sensor Node Requirements: MCU: ARM Cortex-M series, ESP32 (dual core), ATmega328P, Sensors: Analog/Digital (e.g., MQ-2 Gas, MPU6050 IMU), Power Source: Coin cell / Li-ion / Solar, Connectivity: Wi-Fi, BLE, Zigbee, LoRa module, Memory: 32 KB–256 KB Flash, 2 KB–64 KB RAM, Security: Basic encryption support.
CO-2	IoT Gateway Requirements: Processor: ARM Cortex-A or x86 (e.g., Raspberry Pi 4, Jetson Nano), RAM: 512MB to 4GB (based on edge tasks), Storage: SD card (16GB+), eMMC, SSD, Interfaces: USB, UART, SPI, I2C, GPIOs, Connectivity: LAN/WAN: Ethernet, Wi-Fi, LTE/4G, Device: Zigbee, BLE, RS485/Modbus, LoRa, OS Support: Linux, Android Things, Yocto, Windows IoT Core.
CO-3	Design of Sensor Nodes: ESP32 Interfacing-BME280, LVGL, DHT11, SPO2. Raspberry Pi-Python Programming: GPIO Programming, Camera Interfacing, Sensor Interfacing, Connecting to cloud. Power Management Hardware: Battery Management ICs, Voltage Regulators (e.g., AMS1117, LM317), Low Dropout Regulators (LDOs), Solar Chargers (e.g., TP4056 for Li-ion), Sleep modes: Supported by MCU (ESP32, STM32).

TEXTBOOKS:

1	Getting Started With Raspberry Pi - Getting to Know the Inexpensive ARM-Powered Linux Computer, Fourth Edition (Grayscale Indian Edition)
2	"Raspberry Pi Cookbook" by Simon Monk (Publisher: O'Reilly Media)
3	"Exploring Raspberry Pi" by Derek Molloy (Publisher: Wiley)

REFERENCE BOOKS:

1	Bahga, A., & Madiseti, V. (2014). Internet of Things: A hands-on approach. VPT.
2	Buyya, R., & Dastjerdi, A. V. (2016). Internet of Things: Principles and paradigms. Morgan Kaufmann.
3	Hersent, O., Boswarthick, D., & Elloumi, O. (2012). The Internet of Things: Key applications and protocols (2nd ed.). Wiley.

MOOCS/WEB LINKS:

1	https://www.youtube.com/watch?v=xPIN_Tk3VLQ
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2	https://www.youtube.com/watch?v=-6DC_f2tmMM3
3	https://www.youtube.com/watch?v=rDgQZ5c4wdk
3	https://www.youtube.com/watch?v=aUSwEkJCIAA

Annexure-7

Syllabus Revision

1. Program structure (with all Courses) containing the following categorization

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New/Revised/Retained	Stakeholder Category	Justification for considering the feedback
23SDIN01R	IoT hardware programming		1	0	0	4	2	FIS	Revised	Industry Experts / Academia and Students	Upgrades syllabus from basics to system-level IoT design. Meets industry demand for end-to-end IoT skills. Enhances practical exposure and employability.

Percentage of Syllabus Revision= (Total Number of New Courses+ Total Number of Revised Courses)/total number of courses.

2. Course wise Syllabus revision of approved structure as mentioned in point 1(Program structure (with all Courses) containing following categorization).

Course Code	Course Name	Course Category	Existing Syllabus (as per Annexure-3)	New Syllabus (as per Annexure-3)	Topics Added/Removed/Replaced	Change in Outcome	Justification for the Modification	*Overall Revision Percentage
23SDIN01R	IoT hardware programming		raspberry pi Introduction – Pin Configuration – Features - Applications and Software and Driver Tools – raspberrypi OS installation	Analyze IoT gateway requirements including processor architecture (ARM Cortex-A, x86), memory, storage, interfaces (USB, UART, SPI, I2C, GPIO), connectivity	Added: Sensor node development with ESP32, Camera integration, Power management. Replaced:	Outcome expanded from basic device handling to IoT gateway design and	Ensures understanding of gateways as central IoT components, preparing students for large-scale system	~35%



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			–GPIO, control LEDs, Switches, motors, Actuators. Raspberry pi Communication Protocol - Connecting Raspberry Pi to cloud platforms, uploading sensor data to the cloud, Implementing cloud-based dashboards and remote control of devices. raspberry pi Introduction – Pin Configuration – Features - Applications – Software and Driver Tools – raspberry pi OS installation –GPIO, control LEDs, Switches, motors, Actuators.	(Ethernet, Wi-Fi, LTE/4G, Zigbee, BLE, RS485/Modbus, LoRa), and OS support (Linux, Android Things, Yocto, Windows IoT Core). Analyze and develop sensor nodes with ESP32 and Raspberry Pi by interfacing sensors (BME280, DHT11, SPO2), programming GPIOs, integrating camera modules, connecting to cloud, and applying power management techniques using regulators, battery ICs, solar chargers, and sleep modes. Analyze IoT gateway requirements including processor architecture (ARM Cortex-A, x86), memory, storage, interfaces (USB, UART, SPI, I2C, GPIO), connectivity (Ethernet, Wi-Fi, LTE/4G, Zigbee, BLE, RS485/Modbus, LoRa), and OS support (Linux, Android Things, Yocto, Windows IoT Core).	Simple Raspberry Pi OS → Multi-OS (Linux, Yocto, Windows IoT Core). Generic protocols → Detailed connectivity (LTE, Zigbee, BLE, LoRa, Modbus). Simple GPIO usage → Full-fledged sensor node + gateway functions.	evaluation of processing, connectivity, and OS platforms.	design and integration.	
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*Overall Revision Percentage= sum of percentage of Course Outcome revision. Any revision to the tune of 25% or above is considered as a new course. In all other cases the course code is changed, and the course is considered as a revised course.

Each CO revision percentage is calculated based on the extent to which the outcome has been revised through addition or deletion of topics.

COURSE CODE		COURSE CATEGORY			PCC		
COURSE TITLE	IOT SYSTEM DESIGN	L	T	P	S	Cr	CH
		3	0	2	0	4	5
Pre-Requisite Course(s)	FUNDAMENTALS OF IOT AND SENSORS	Course Offering Department			IoT		

COURSE OBJECTIVES:

1. Introduce the fundamental concepts of the Internet of Things (IoT), including architecture, design principles, deployment models, enabling technologies, and IoT design methodology.
2. To impart knowledge on IoT communication protocols, messaging models, and wireless technologies for short-, medium-, and long-range communications and their selection criteria.
3. Familiarize students with industrial IoT systems, data acquisition methods, industrial communication protocols, and wearable IoT devices, along with their design considerations and applications.



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COURSE OUTCOMES:

CO NO.	COURSE OUTCOME (CO)	PO/PSO	BTL
CO-1	Understand the fundamental concepts of IoT, including its architecture, design principles, levels of deployment, and enabling technologies.	PO1, PO2, PSO1	2
CO-2	Apply various IoT communication and messaging protocols such as MQTT, CoAP, HTTP, and XMPP; and select suitable wireless technologies based on application requirements.	PO1, PO2, PO3, PSO1	3
CO-3	Design networked sensor systems by applying IoT communication models and protocol stacks using Bluetooth,	PO3, PO4, PSO1	3
CO-4	Implement Industrial IoT systems using SCADA, PLCs, and industrial protocols such as Modbus, CAN, and OPC-UA; and design wearable IoT solutions for practical applications.	PO1, PO5, PSO1	3
CO-5	Analyze and develop IoT-based applications by integrating sensors, actuators, and wireless communication protocols; and demonstrate the use of messaging and industrial protocols for solving real-world problems.	PO1, PO3, PO5, PSO1	4

COURSE ARTICULATION MATRIX

	P0-1	P0-2	P0-3	P0-4	P0-5	P0-6	P0-7	P0-8	P0-9	P0-10	P0-11	PSO 1	PSO 2
CO-1	3	1	-	-	-	-	-	-	-	-	-	3	-
CO-2	2	1	2	-	-	-	-	-	-	-	-	2	-
CO-3	-	-	1	2	-	-	-	-	-	-	-	2	-
CO-4	2	-	-	-	2	-	-	-	-	-	-	2	-
CO-5	2	-	2	-	3	-	-	-	-	-	-	3	-
Average	2.33	2	3	3	-	-	-	-	-	-	-	2.60	-

SYLLABUS:

CO-1	Introduction to IoT. IoT definition, Key challenges in IoT architecture, Characteristics of IoT Physical Design of IoT ,Logical Design of IoT , IoT Levels & Deployment Templates,M2M ,Differences and Similarities between M2M and IoT • SDN and NFV for IoT,IoT Reference Architecture, Perception Layer, Network Layer, Middleware Layer, Application Layer, and Business Layer, IoT Enabling Technologies,Design principles for Connected device.IoT Design Methodology
CO-2	IoT Communication Protocols and : Messaging and Application Layer Protocols, MQTT: Architecture, MQTT brokers (e.g., Mosquito, HiveMQ), QoS levels, publish-subscribe mechanism, UDP: Lightweight datagram protocol for constrained devices, HTTP & CoAP: RESTful protocols, synchronous vs asynchronous communication, XMPP: Extensible Messaging and Presence Protocol for device communication, Gateway Protocols: Bridging non-IP and IP-enabled devices, Selection of Wireless Technologies, Criteria: Range, power consumption, data rate, cost, scalability
CO-3	Wireless Technologies: Short-Range Wireless Technologies: Bluetooth, ZigBee (IEEE 802.15.4): Protocol Stack, Mesh Networking, ZigBee vs BLE vs Wi-Fi, RFID and NFC. Medium-Range Wireless Technologies: Wi-Fi (IEEE 802.11), Architecture and Operation, Wi-Fi Modes: AP, Station, SoftAP, Power Consumption in Wi-Fi Devices, Wi-Fi Direct and Ad-Hoc Networking. Long-Range Wireless Technologies: LoRa and LoRaWAN, LoRa Network Architecture (End Device, Gateway, Network Server). Cellular IoT Overview.
CO-4	Industrial IoT Architecture and Protocols, Data Acquisition and Processing - importance of SCADA, PLCs in process control and industrial automation; PLC hardware architecture and PLC Programming. Modbus, PROFIBUS, CAN, Network Level: OPC-UA, HART. Wearable IoT Devices: Definition and evolution of wearable technology, Applications, Design considerations: comfort, weight, battery life, Sensors for Wearables, Flexible and stretchable electronics
CO-5	Analyze and implement IoT-based applications by interfacing sensors, actuators, and wireless communication protocols and demonstrate the use of messaging and industrial communication protocols for real-world problem solving.

TEXTBOOKS:

1	Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
2	Vijay Madisetti, Arshdeep Bahga, Adrian McEwen(Author),Hakim Cassimally “Internet of Things A Hands-on-Approach” Arshdeep Bahga & Vijay Madisetti,2014.
3	Smith, J., Johnson, E., & Lee, D. (2024). Security and Privacy in the Internet of Things (1st ed.). Tech Innovations Press.

REFERENCE BOOKS:

1	Bassi, Alessandro, et al, “Enabling things to talk”, Springer-Verlag Berlin An, 2016.
2	Buyya, Rajkumar, and Amir Vahid Dastjerdi, eds. Internet of Things: Principles and paradigms. Elsevier,2016.
3	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press,2017
4	JanHoller, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

MOOCS/WEB LINKS:

1	https://www.altexsoft.com/blog/iot-architecture-layers-components
2	https://www.coursera.org/learn/iot-wireless-cloud-computing/home/welcome
3	https://www.wiley.com/enit/Internet+of+Things%3A+Architectures%2C+Protocols+and+Standards https://wso2.com/whitepapers/a-reference-architecture-for-the-internet-of-things/ https://www.igi-global.com/chapter/iot-architecture-and-protocols-in-5g-environment/185923

Annexure-7

Syllabus Revision

1. Program structure (with all Courses) containing the following categorization

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New/Revised/Retained	Stakeholder Category	Justification for considering the feedback
23IN2101R	IoT System Design		3	0	2	0	4	FIS	In CO3: Demonstrate the use of sensors, actuators, and communication modules in IoT applications, Several COs were modified/expanded to incorporate logical design, communication modules, cloud integration, and wider application domains such as healthcare and	Industry Experts / Academia and Students	The feedback-driven changes aim to bridge the gap between academia and industry, preparing students for real-world IoT



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									agriculture.			applications in domains like smart cities, healthcare, and agriculture..
									Students gain exposure to end-to-end IoT solutions aligned with Industry 4.0 needs.			

Percentage of Syllabus Revision= (Total Number of New Courses+ Total Number of Revised Courses)/total number of courses.

2. Course-wise syllabus revision of approved structure as mentioned in point 1(program structure (with all courses) containing the following categorization).

Course Code	Course Name	Course Category	Existing Syllabus (as per Annexure-3)	New Syllabus (as per Annexure-3)	Topics Added/Removed/Replaced	Change in Outcome	Justification for the Modification	*Overall Revision Percentage
			IoT Reference Architecture: Introduction to IoT, Characteristics of IoT, IoT Architecture, Physical Design of IOT, Logical design of IoT, IoT enabling Technologies, IoT Levels & Development Templates, Difference between IoT and M2M, SDN and NFV for IoT. RFIDs, and wireless sensor networks technology. IoT Programming language and Tools.	Introduction to IoT. IoT definition, Key challenges in IoT architecture, Characteristics of IoT Physical Design of IoT, Logical Design of IoT, IoT Levels & Deployment Templates, M2M Differences and Similarities between M2M and IoT • SDN and NFV for IoT, IoT Reference Architecture, Perception Layer, Network Layer, Middleware Layer, Application Layer, and Business Layer, IoT Enabling Technologies, Design principles for Connected device. IoT Design Methodology	Added: IoT definition, Key challenges in IoT architecture, Perception/Network/Middleware/Application/Business Layer, Design principles for connected devices, IoT Design Methodology. Removed/Replaced: RFIDs, Wireless Sensor Networks (shifted to communication layer), IoT Programming language/tools.	Outcome shifts from basic understanding of IoT concepts, to layered architectural, design-oriented, and problem-solving perspective.	To align with industry framework s (5-layer IoT architecture, methodology-based design) and emphasize design thinking in IoT solutions.	≈40%



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			IoT Communication Technologies: wired - ModBUS, Wireless - Bluetooth, BLE, IEEE 802.11, IEEE 802.15, Zigbee, SIGFOX. IoT Networking Protocols: IPv4 and IPv6, lowPAN, TCP/IP, IP addressing of IoT devices, MAC addresses of communication circuit.	IoT Communication Protocols and : Messaging and Application Layer Protocols, MQTT: Architecture, MQTT brokers (e.g., Mosquito, HiveMQ), QoS levels, publish-subscribe mechanism, UDP: Lightweight datagram protocol for constrained devices, HTTP & CoAP: RESTful protocols, synchronous vs asynchronous communication, XMPP: Extensible Messaging and Presence Protocol for device communication, Gateway Protocols: Bridging non-IP and IP-enabled devices, Selection of Wireless Technologies, Criteria: Range, power consumption, data rate, cost, scalability	Added: MQTT (detailed), QoS levels, Publish-Subscribe, UDP, HTTP vs CoAP, XMPP, Gateway Protocols, Selection criteria (range, power, cost). Removed/Replaced: Broad mention of “wired ModBUS” and basic wireless list → replaced with application-layer & messaging protocols.	Outcome moves from awareness of protocols to hands-on application knowledge with messaging, lightweight protocols, and broker-based communication.	Reflects real-world IoT communication needs (MQTT, CoAP widely used in cloud-integrated IoT). Also builds practical skill in protocol selection.	≈60%
			Web connectivity for connected devices Application Protocols – HTTP, Web sockets, Node, MQTT, UDP, CoAP,	Wireless Technologies: Short-Range Wireless Technologies: Bluetooth, ZigBee (IEEE 802.15.4): Protocol Stack, Mesh Networking, ZigBee vs BLE vs Wi-Fi, RFID and	Added: Short-range (BLE, Zigbee, RFID, NFC), Medium-range (Wi-Fi architecture, modes, power use), Long-range	Outcome shifts from basic web APIs to comprehensive wireless technology	Industry trend: wireless connectivity is backbone of IoT → new content ensures students can	≈70%



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			XMPP, AMQP and gateway protocols. Link Layer protocols: 802.3 – Ethernet 802.11 – WiFi 802.16 – WiMax 802.15.4 – LR-WPAN,2G/ 3G/ 4G. Cloud storage Models and Communication APIs. Web application management protocol, Python web application framework.	NFC. Medium-Range Wireless Technologies: Wi-Fi (IEEE 802.11), Architecture and Operation, Wi-Fi Modes: AP, Station, SoftAP, Power Consumption in Wi-Fi Devices, Wi-Fi Direct and Ad-Hoc Networking. Long-Range Wireless Technologies: LoRa and LoRaWAN, LoRa Network Architecture (End Device, Gateway, Network Server). Cellular IoT Overview.	(LoRa, LoRaWAN, Cellular IoT). Removed/Replaced: Cloud storage models, APIs, Python web frameworks.	stack with BLE/Zigbee/LoRa/Cellular IoT in practical deployment architects. ure-level insights.		
			IoT design consideration s, Prototyping IoT solutions, Design IoT development Frameworks: Case studies illustrating IoT design: Home Automation: Smart lighting, Smart Appliances, Cities: Smart Parking, Smart Lighting, Smart Roads, Emergency response, Environment: Weather	Industrial IoT Architecture and Protocols, Data Acquisition and Processing - importance of SCADA, PLCs in process control and industrial automation; PLC hardware architecture and PLC Programming. Modbus, PROFIBUS, CAN, Network Level: OPC-UA, HART. Wearable IoT Devices : Definition and evolution of wearable technology, Applications.	Added: Industrial IoT, SCADA, PLCs, Modbus/PROFIBUS/CAN/OPC-UA/HART, Wearables (definition, design factors, sensors, flexible electronics). Removed/Replaced: Case studies (Smart Home, City, Agriculture, Environment)	Outcom e expands from general case-study awaren ess to industrial and wearabl e IoT applicat ions with deeper focus on automa tion & process control.	Emphasis on Industry 4.0 alignment (SCADA, PLCs, IIoT) and emerging wearable technologie s (health, consumer IoT). Strong research & industry relevance.	≈80%

			monitoring, Air Pollution Monitoring, Noise pollution, Forest fire, River flood, Agriculture: Smart irrigation, Green House control.	Design considerations: comfort, weight, battery life, Sensors for Wearables , Flexible and stretchable electronics				

*Overall Revision Percentage= sum of the percentage of Course Outcome revisions. Any revision to a tune of 25% or above was considered a new course. In all other cases, the course code is changed, and the course is considered revised.

Each CO revision percentage was calculated based on the extent to which the outcome has been revised through the addition or deletion of topics.

Course Code-

Course Name Cloud Computing For IOT

L-T-P-S:

Credit:

prerequisite

CO#	Course Outcome (CO)	PO	PSO	BTL
CO1	Apply the concepts of cloud computing services to implement IoT applications.	PO1, PO2	PSO1	3
CO2	Apply various cloud infrastructure, virtualization, and storage services to store sensor data.	PO1, PO2	PSO1	3
CO3	Develop IoT applications using cloud-based IoT platforms.	PO1, PO2, PO3	PSO1	3

Syllabus:

CO-1	Introduction to Cloud Computing and IoT: Introduction to Cloud Computing, Synergy between IoT and Cloud Computing: Case studies: Smart cities, healthcare, and industrial IoT. Challenges of IoT data management without cloud infrastructure. IoT Architectures and Cloud Integration: Cloud-based IoT architectures: Centralized vs. edge/fog computing. Role of cloud in IoT: Data storage, computation
CO-2	Cloud Computing Fundamentals for IoT: Cloud Service Virtual machines, containers (Docker), and hypervisors. Cloud providers for IoT: AWS IoT Core, Azure IoT Hub, Google Cloud IoT. Connect a Raspberry Pi or ESP32 to a cloud platform and send sensor data.
CO-3	Cloud Storage and Data Management for IoT: IoT data characteristics, Cloud storage solutions Data migration techniques from IoT devices to the cloud. Store IoT sensor data in

	a cloud database (e.g., AWS S3 or Azure Blob Storage). Analysis. Tools : AWS IoT Analytics or Google Cloud to analyze and visualize IoT data. Security and Privacy in Cloud-IoT Systems. :Cloud-Based IoT Platforms.: AWS IoT Core, Azure IoT Hub, Google Cloud IoT Core. Serverless computing for IoT: AWS Lambda, Azure Functions. Microservices and cloud-native IoT applications. Case Studies
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Textbooks:

1	Cloud Computing A Practical Approach for Learning and Implementation, ", A Srinivasan, J Suresh , 2014, Pearson
2	"Cloud Computing, A Practical Approach", Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, 2009, Tata-McGraw-Hill Osborne Media.
3	"Cloud computing: Data intensive computing and scheduling", Magoules, Frederic, 2019, Chapman & Hall.

Reference Books:

1	Erl, T., Mahmood, Z., & Puttini, R. (2013). Cloud computing: Concepts, technology & architecture. Prentice Hall.
2	Sosinsky, B. (2011). Cloud computing Bible. Wiley.
3	Buyya, R., Vecchiola, C., & Selvi, S. T. (2013). Mastering cloud computing: Foundations and applications programming. Morgan Kaufmann.

MOOCS/Web Links:

1	https://www.youtube.com/watch?v=NzZXz3fJf6olist=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J
2	https://www.coursera.org/learn/iot-wireless-cloud-computing
3	https://www.coursera.org/learn/cloudcomputing?specialization=cloud-computing

Justification:

In the previous academic year, the course included both lectures and practical components. In the current academic year, it has been revised into an SDC course, with the COs reduced to three and greater emphasis placed on practical concepts