OPEN ELECTIVE OTHER THAN PARTICULAR PROGRAM (OE)

Industry oriented Open Elective :AIOT

Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Information Technology				
IOE3321: Open Elective I IoT Hardware and Sensors				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		ISE	50
Tutorials	00 Hrs/week		ESE	50
Total Credits	03		Duration of ESE	As applicable

Prerequisite : Mathematics, Programming for problem solving/Computer fundamentals

Course Outcomes (CO): Students will be able to

CO1	Understand the foundational principles and hardware of IoT
CO2	Apply IoT circuit and programming software:
CO3	Develop AI models and integrate with IoT:
CO4	Analyze and implement AIoT applications:

	Course Contents	CO	Hours
Unit 1	**Introduction to IoT Hardware:** Overview of IoT development kits (e.g., Raspberry Pi, Arduino, ESP32) Understanding the components and capabilities of IoT hardware platforms Types of sensors (temperature, humidity, motion, light, etc.) Exploring actuators (motors, servos, relays) and their applications in IoT.	**CO1**	**(05)**
Unit 2	**IoT Circuit and Programming Software:** IoT Circuit Designing Software: Software with drag & drop features to build a circuit, Block Designer Software for IoT Programming, Introduction to IoT hardware components and connectivity, Simulation of IoT circuits in a virtual environment, Hands-on practice with IoT development boards and sensors	**CO2**	**(07)**
Unit 3	**AI and Python Programming Software:** Block Designer Software for AI Programming, Python Direct Software for Python Programming, Introduction to AI concepts and machine learning basics,Developing AI models using block-based programming, Implementing Python scripts for data analysis and AI applications, Integrating AI models with IoT devices for smart solutions.	**CO3**	**(06)**
Unit 4	**Introduction to Artificial Intelligence and Internet of Things (AIoT)** Overview of Artificial Intelligence (AI) and its applications across various industries. Introduction to the Internet of Things (IoT) and its significance in the modern interconnected world. Understanding the concept of Artificial Intelligence of Things (AIoT) and its potential to revolutionize technology integration.	**CO4**	**(09)**
Unit 5	**Connecting Mobile Devices to IoT Gateways** Exploring the role of IoT gateways in bridging the gap between mobile devices and IoT networks. Techniques for establishing seamless connections between mobile devices and IoT gateways. Hands-on exercises demonstrating the setup and configuration of mobile-to-IoT connections.	**CO1**	**(06)**
Unit 6	**Sensor Technologies and Academic Concepts** Comprehensive overview of sensor technologies commonly employed in IoT applications. In-depth exploration of various types of sensors and their academic underpinnings. Practical demonstrations and experiments showcasing the functionality and applications of sensors in IoT systems.	**CO4**	**(07)**

Text Books

1.	Matt Richardson and Shawn Wallace - "Getting Started with Raspberry Pi" - O'Reilly Media - 2016
2.	Eric Matthes - "Python Crash Course" - No Starch Press - 2019
3.	Arshdeep Bahga and Vijay Madisetti - "Internet of Things: A Hands-On Approach" - VPT - 2014

Reference Books

1.	Michael Margolis - "Arduino Cookbook" - O'Reilly Media - 2011
2.	Patrick F. Dunn - "Fundamentals of Sensors for Engineering and Science" - CRC Press - 2010

3.	Aurélien Géron - "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" - O'Reilly Media - 2019
Useful Links	
1.	https://nptel.ac.in/courses/106105195
2.	https://www.coursera.org/learn/iot
3.	https://www.tinkercad.com/things?type=circuits&sort=staff&view_mode=small

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	1	3	3	-	-	2	-	-	1
CO 2	2	2	2	2	3	1	-	-	3	-	3	2
CO 3	2	1	3	2	3	3	1	1	3	2	3	3
CO 4	2	2	3	3	3	2	1	-	2	1	3	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	ISE	ESE
Remember		
Understand	10	10
Apply	15	15
Analyse	15	15
Evaluate	10	10
Create		
TOTAL	50	50

Government College of Engineering, Karad					
Second Year (Sem – III) B. Tech. Information Technology					
IOE3322: Open Elective -01 Lab - IoT Hardware and SensorsLab					
Laboratory Scheme:			**Examination Scheme:**		
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	25	
Prerequisite : Mathematics, Programming for problem solving					
Course Outcomes (CO): Students will be able to					
CO1	Understand IoT hardware fundamentals and development kits.				
CO2	Apply IoT circuit design and programming using software tools.				
CO3	Demonstrate proficiency in sensor technologies for IoT applications.				
CO4	Integrate AI concepts and Python programming with IoT devices for smart solutions.				
Course Contents					**CO**
Implementation of following concepts					
Experiment 1	Setting up Raspberry Pi for IoT applications				**CO1**
Experiment 2	Configuring Arduino for sensor data collection				**CO1**
Experiment 3	Using ESP32 for wireless communication in IoT				**CO1**
Experiment 4	Designing IoT circuits using drag & drop software				**CO2**
Experiment 5	Programming IoT devices with block-based software				**CO2**
Experiment 6	Measuring temperature and humidity with DHT11 sensor				**CO3**
Experiment 7	Detecting motion with PIR sensor				**CO3**
Experiment 8	Controlling LEDs with relay modules				**CO3**
Experiment 9	Developing AI models with block designer software				**CO4**
Experiment 10	Implementing Python scripts for data analysis				**CO4**
Experiment 11	Integrating AI models with IoT devices for smart applications				**CO4**
Experiment 12	Mini Project on the basis of learning				**CO4**
List of Submission:					
	Minimum number of Experiments : 10				

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CO 1	3	2	1	1	3	3	2	-	1	1	1	1
CO 2	2	3	1	2	3	-	3	-	2	2	2	2
CO 3	2	1	3	2	3	3	3	1	3	2	3	3
CO 4	2	2	2	3	3	1	2	1	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad

Second Year (Sem – IV) B. Tech. Information Technology

IOE3423: Open Elective II Fundamentals of AIoT

Teaching Scheme			Examination Scheme	
Lectures	02 Hrs/week		ISE	50
Tutorials	00 Hrs/week		ESE	50
Total Credits	02		Duration of ESE	As applicable

Prerequisite : IoT Hardware & Sensors, Programming for problem solving

Course Outcomes (CO): Students will be able to

CO1	Understand the concepts of AIoT and their significance in modern industries.
CO2	Apply techniques to connect mobile devices to IoT gateways, bridging the gap between different networks.
CO3	Analyze sensor technologies in IoT and their academic foundations to showcase practical understanding.
CO4	Develop and Evaluate AIoT applications to address real-world challenges.

	Course Contents	CO	Hours
Unit 1	**Introduction to Artificial Intelligence and Internet of Things (AIoT)** Overview of Artificial Intelligence (AI) and its applications across various industries. Introduction to the Internet of Things (IoT) and its significance in the modern interconnected world. Understanding the concept of Artificial Intelligence of Things (AIoT) and its potential to revolutionize technology integration.	**CO1, CO2**	**(04)**
Unit 2	**Connecting Mobile Devices to IoT Gateways** Exploring the role of IoT gateways in bridging the gap between mobile devices and IoT networks. Techniques for establishing seamless connections between mobile devices and IoT gateways. Hands-on exercises demonstrating the setup and configuration of mobile-to-IoT connections.	**CO1, CO2**	**(05)**
Unit 3	**Sensor Technologies and Academic Concepts** Comprehensive overview of sensor technologies commonly employed in IoT applications. In-depth exploration of various types of sensors and their academic underpinnings. Practical demonstrations and experiments showcasing the functionality and applications of sensors in IoT systems.	**CO3**	**(06)**
Unit 4	**AIoT Application Development** Introduction to tools and platforms essential for building AIoT applications. Practical Aspects of AIoT applications, including: Smart Traffic Signal System for Color Blind Individuals Plant Health Analysis Smart Door Access Control System.	**CO4**	**(05)**
Unit 5	**Unit 5: Weather Forecasting with AIoT** Design and implementation of a weather forecasting system leveraging AIoT technologies. Integration of real-time weather data from sensors with AI algorithms for accurate predictions. Hands-on exercises for building, testing, and refining weather forecasting systems.	**CO4**	**(05)**
Unit 6	**Unit 6: Smart Solutions Development** Development and deployment of smart solutions utilizing AIoT principles. Case studies and real-world examples of successful smart solutions in various domains. Project-based learning allowing students to conceptualize, design, and implement their own AIoT solutions**.**	**CO4**	**(06)**

Text Books

1.	Michael Negnevitsky, "Artificial Intelligence: A Guide to Intelligent Systems", Pearson Education, 2021
2.	Rajkumar Buyya, Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms", Morgan Kaufmann, 2016
3.	Michael J. McGrath, "Sensor Technologies: Healthcare, Wellness and Environmental Applications", Apress, 2013

Reference Books

1.	Chandra Singh, K V S S S S Sairam, Niranjan N Chiplunkar, Rathishchandra R Gatti Create citation, "Self-Powered Aiot Systems":Apple Academic Press 2024
2.	Kashif Naseer Qureshi, Thomas Newe Artificial Intelligence of Things (AIoT): New Standards, Technologies and Communication Systems, CRC Press 2024

Useful Links

1.	https://www.linkedin.com/learning/ai-in-connected-products-aiot
2.	https://www.coursera.org/learn/iot
3.	https://www.tinkercad.com/things?type=circuits&sort=staff&view_mode=small

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CO 1	3	1	2	1	2	2	-	-	-	-	-	2
CO 2	2	2	1	2	3	2	-	-	-	1	-	2
CO 3	3	2	3	3	3	2	2	1	1	1	1	3
CO 4	2	3	2	3	3	2	1	-	1	2	1	3

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	ISE	ESE
Remember	5	5
Understand	10	10
Apply	10	10
Analyse	10	10
Evaluate	15	15
Create	-	-
TOTAL	50	50

Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Information Technology

IOE3524: Open Elective III Cloud Services for IoT

Teaching Scheme			Examination Scheme	
Lectures	02 Hrs/week		ISE	50
Tutorials	00 Hrs/week		ESE	50
Total Credits	02		Duration of ESE	As applicable

Prerequisite : Fundamentals of AIoT

Course Outcomes (CO): Students will be able to

CO1	Understand cloud computing's benefits for IoT and grasp various cloud service models.
CO2	Apply cloud storage solutions for IoT data storage and retrieval.
CO3	Implement cloud compute services to deploy, manage IoT applications& its security concerns.
CO4	Integrate AI/ML capabilities into IoT projects using cloud services and ensure cloud security and compliance for IoT data.

	Course Contents	CO	Hours
Unit 1	**Introduction to Cloud Computing** Overview of cloud computing and its benefits for IoT, Understanding different cloud service models (IaaS, PaaS, SaaS)	**CO1**	**(03)**
Unit 2	**Cloud Storage Solutions** Introduction to cloud storage services (Amazon S3, Google Cloud Storage)exercises on storing and retrieving data from cloud storage platforms.	**CO2**	**(04)**
Unit 3	**Cloud Compute Services:** Overview of cloud compute services (Amazon EC2, Google Compute Engine)Deploying IoT applications on cloud compute instances.	**CO2**	**(05)**
Unit 4	**AI/ML Services in the Cloud:** Introduction to AI/ML services provided by cloud platforms (Amazon SageMaker, Google AI Platform, Azure AI), Integrating AI/ML capabilities into IoT applications using cloud services.	**CO4**	**(04)**
Unit 5	**Cloud Security and Compliance:** Security best practices for cloud-based IoT solutions. Compliance requirements and regulations for IoT data stored in the cloud.	**CO3**	**(05)**
Unit 6	**Project Work and Case Studies:** Developing and deploying IoT applications leveraging cloud services Analyzing case studies of successful IoT projects using cloud platforms	**CO3, CO4**	**(06)**

Text Books

1. Buyya R, Vecchiola C, Selvi S T "Mastering Cloud Computing" , McGraw Hill Education (India), 2013
2. Praveen Kukreti Google Cloud Platform All-In-One Guide: Get Familiar with a Portfolio of Cloud-based Services in GCP,2023
3. Pawan Varma "Cloud Native Development with Azure: A practical guide to build cloud-native apps on Azure cloud platform, 2024

Reference Books

1. Cloud Computing Bible, Barrie Sosinsky ,Wiley Publishing Inc. 2011
2. Cloud Computing from Beginning to End by Ray J Rafaels
3. Cloud Computing: Concepts, Technology & Architecture by Zaigham Mahmood, Ricardo Puttini, Thomas Erl

Useful Links

1. https://www.udemy.com/course/exploring-aws-iot/
2. https://www.coursera.org/specializations/mlops-machine-learning-duke
3. https://learn.microsoft.com/en-us/training/paths/microsoft-azure-architect-design-prerequisites/

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CO 1	3	2	2	1	3	-	-	-	-	-	-	1
CO 2	2	2	3	2	3	1	-	-	-	-	-	2
CO 3	3	3	2	3	3	2	1	1	1	-	2	1
CO 4	2	2	2	3	3	1	1	1	1	1	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	ISE	ESE
Remember	5	5
Understand	10	10
Apply	15	15
Analyse	10	10
Evaluate	10	10
Create	-	-
TOTAL	50	50