2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Internet of Things**
Course Code:	**COMP-556**
Program:	**BS – Computer Science**
Department:	**Computer Science**
College:	**Engineering & Computer Science**
Institution:	**Jazan University**
Version:	1
Last Revision Date:	09/09/2024

Table of Contents

A. General information about the course: 3

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods 4

C. Course Content 5

D. Students Assessment Activities 6

E. Learning Resources and Facilities 7

F. Assessment of Course Quality 7

G. Specification Approval 8

A. General information about the course:

1. Course Identification

1. Credit hours: (3 hours **)**					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (10 Level / 5th Year)					
4. Course general Description:					
The Internet of Things (IoT) course provides students with the skills to program using current, leading IoT technologies for developing IoT solutions, such as Smart Homes and Smart Campuses, through the integration of IoT sensors and devices. The course will explore the fundamental concept of IoT, focusing on the "things" that constitute the Internet of Things, including how these components are interconnected, how they communicate, and how they add value to the data they generate. Additionally, the course will address critical issues of cybersecurity and privacy, emphasizing how IoT can optimize processes and enhance efficiency in business contexts. Students will also learn how to capture data using sensors, as well as the basics of data analysis, visualization in the cloud, and ensuring data security.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Pre-requirements for this course (if any)**:**					
None					
7. Course Main Objective(s):					
Upon completion of the course, students will: ♦ Understand IoT principles, design and abstraction of developing IoT systems. ♦ Explain in a concise manner how the general Internet as well as Internet of Things works. ♦ Understand constraints and opportunities of wireless and mobile networks for Internet of Things. ♦ Analyses trade-offs in interconnected wireless embedded sensor networks. ♦ Develop on a variety of open source devices and software services. ♦ Integrate a variety of IoT devices, sensors and services to build complex applications.					

- Learn the basics of Raspberry Pi and compatible programming frameworks.
- Present and demonstrate the developed system.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	52	100%
2	E-learning	No credit- Blackboard LMS is used as a e-learning tool for assignments, Quiz and video tutorials.	
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**22**
2.	**Laboratory/Studio**	**22**
3.	**Field**	**-**
4.	**Tutorial**	**-**
5.	**Others (Revision + Exam)**	**8**
Total		52

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand IoT principles, design and abstraction of developing IoT systems	K1	Visual & Verbal & Practical [Lectures / Presentations] with Inductive / deductive organization.	Exams, Lab Exam
1.2	Explain in a concise manner how the	K2	Visual & Verbal & Practical [Lectures /	Exams, Lab Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	general Internet as well as Internet of Things works.		Presentations] with Inductive / deductive organization.	
1.3	Understand constraints and opportunities of wireless and mobile networks for Internet of Things.	K2	Visual & Verbal & Practical [Lectures / Presentations] with Inductive / deductive organization.	Exams, Lab Exam, Assignment
2.0	**Skills**			
2.1	Develop on a variety of open source devices and software services.	S1	Visual & Verbal & Practical [Lectures / Presentations] with Inductive / deductive organization.	Exams, Lab Exam, Assignment
2.2	Integrate a variety of IoT devices, sensors and services to build complex applications.	S2	Visual & Verbal & Practical [Lectures / Presentations] with Inductive / deductive organization.	Exams, Lab Exam, Assignment
2.3	Learn the basics of Raspberry Pi and compatible programming frameworks.	S3	Visual & Verbal & Practical [Lectures / Presentations] with Inductive / deductive organization.	Exams, Lab Exam, Assignment
3.0	**Values, autonomy, and responsibility**			
3.1	Justify their ability to function as an effective team player to achieve a common goal.	V1	Group meetings, Work distribution among the team members.	Assignment/ Mini Project

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to IoT** ▪ Definition and scope of IoT ▪ IoT ecosystem: Sensors, Actuators, Connectivity, Data Processing ▪ IoT Architecture & Protocols	**4T+4P**
2.	**IoT Sensing and Actuation** ▪ Types of sensors and actuators used in IoT ▪ Sensor interfacing techniques	**4T+4P**
3.	**IoT Hardware Platforms**	**4T+4P**

	▪ Overview of popular IoT hardware platforms (Arduino, Raspberry Pi) ▪ Embedded systems in IoT ▪ Power management in IoT devices	
4.	**Networking in IoT** ▪ Introduction ▪ IEEE 802.15.4, ▪ Zigbee, ▪ Thread ▪ Wireless HART, ▪ RFID and NFC, ▪ Z-Wave, ▪ Weightless ▪ LoRa ▪ NB-IoT ▪ Wi-Fi ▪ Bluethooth	**4T+4P**
5.	**Data Management & Cloud Integration** ▪ Introduction ▪ Data collection, storage, and management in IoT ▪ Cloud platforms for IoT (AWS IoT, Azure IoT Hub, Google Cloud IoT) ▪ Big Data analytics and IoT	**4T+4P**
6.	**Security & Privacy in IoT** ▪ Common security threats and vulnerabilities in IoT ▪ Privacy concerns and ethical considerations ▪ Security frameworks and best practices	**2T+2P**
7.	**Revision**	**2T**
Total		**24T+22P**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid Exam	**7th Week**	**15%**
2.	Assignment 1	**8th Week**	**15%**
3.	Assignment 2	**10th Week**	**10%**
4.	Final Lab Exam	**12th Week**	**20%**
5.	Final Theory Exam	**As per schedule**	**40%**
Total			**100%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Introduction to IoT, by Sudip Misra, Anandarup Mukherjee, Arijit Roy ISBN: 9781108842952, Year 2021, Publisher Cambridge University Press
Supportive References	• Peter Waher, Learning Internet of Things, Packt Publications, ISBN:9781783553532, Year, 2015. • Gaston C. Hillar, Internet of Things with python, Packt Publications, ISBN: 9781785881381, Year 2016.
Electronic Materials	https://www.circuito.io/app?components=9240,9443,200000,488167 https://realpython.com/python-raspberry-pi/ **https://wyliodrin.studio/** **https://wokwi.com/projects/new/pi-pico**
Other Learning Materials	https://www.leverege.com/iot-ebook/ui-and-ux-design-iot

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One lecture room equipped with smart screen. Well-equipped Lab with Raspberry Pi 4 (Model B) Kit Or Raspberry Pi Simulator like wyliodrin studio
Technology equipment (projector, smart board, software)	Python, wyliodrin studio, Raspberry Pi 4 microcontroller etc.
Other equipment (depending on the nature of the specialty)	One specialized hardware lab fully equipped with various Hardware Kits Such as Raspberry Pi 4.0 (Model B) Kit and Experiment Module Kits with Required accessories.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Course Evaluation Survey Form)
Effectiveness of Students assessment	CRC/QAU/HOD	Direct (Course Report/Result Analysis)
Quality of learning resources	Track Leader/CRC	Indirect (Review, meetings and star rating with suggestions for further

Assessment Areas/Issues	Assessor	Assessment Methods
		modification and improvements)
The extent to which CLOs have been achieved	CRC/QAU	Direct (CLO assessment template further verified by course coordinator, Track leader and QAU)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	MEETING NO.1, AGENDA NO.2
DATE	09/09/2024