1.	Course title	**Internet of Things**
2.	Course number	**1905430**
3.	Credit hours (theory, practical)	3 (theory + practical)
	Contact hours (theory, practical)	3 (theory + practical)
4.	Prerequisites/corequisites	Artificial Intelligence (1905320) & Computer Networks (1901363)
5.	Program title	Artificial Intelligence
6.	Year of study and semester (s)	**Spring 2024**
7.	Final Qualification	Bachelor (B. Sc.)
8.	Other department (s) involved in teaching the course	-
9.	Language of Instruction	English
10.	Date of production/revision	**February, 2024**
11.	Required/ Elective	**Obligatory**

12. Course Coordinator:

Dr. Sherenaz Al-Haj Baddar
Office number:
121
Office hours: STR: 11:30-12:30
Phone number: 22589
Email address: s.baddar@ ju.edu.jo

13. Other instructors:

N/A

14. Course Description:

*Internet-of-Things (IoT) course aims at preparing students to the IoT market, given the increasing demand for professionals on this hot emerging area. The course presents the latest **IoT applications**, **devices**, **technologies**, **architecture, communication protocols** and trends. **IoT middleware/streaming** applications used in IoT will be reviewed. **IoT challenges including cybersecurity challenges, skills needed and best practices** will also be covered. Part of the course will deal with **developing real-world IoT** applications/mobile application prototypes from the **sensor** design to the **end-user** applications to solve existing problems in the society. Moreover, the course utilizes **artificial Intelligence algorithms to build models and large-scale** systems to solve problems such as telco management, intelligent transportation, urban planning, real time crowd management, retail intelligence, and industry 4.0 using telco and other data sources. It also introduces typical application scenarios in which IoT provides innovative new services to enhance productivity and save costs. Active learning methodologies will be applied through **role playing**, **presentations** and **problem-solving exercises**. Moreover, **hands-on practice** on developing **real-world IoT** applications will be weekly practiced in the lab. In addition, guest speakers belonging to the Jordan's ICT will demonstrate state-of-the-art practices and application of IoT.*

15. Course aims and outcomes:

A- Aims:

This course aims to equip students with the necessary skills ……

B- Intended Learning Outcomes (ILOs):

[Level Descriptor: Knowledge]

- Knowledge and understanding: Students should:

A1) Understand the basic concepts pertaining to IoT Traffic Models and connectivity

A2) Understand the basic concepts pertaining to IoT Architectures

[Level Descriptor: Skills]

- Intellectual skills: with the ability to:

B1) Distinguish different IoT systems communication protocols

B2) Contrast different types of security threats that jeopardize IoT systems soundness

[Level Descriptor: Skills]

- Subject specific skills: with ability to

C1) Design an IoT system comprising an IoT device, network gateway, and a Cloud server using a software tool

C2) Stream the data generated from the IoT device to the cloud server

C3) Apply Cloud-based analytics tool to the collected data and building visualizations

[Level Descriptor: Competencies]

Subject-specific Competencies include the ability to:

D1) Implement an IoT-based project in which students utilize an IoT ecosystem comprising utilizing real-life IoT data and Cloud-based analytics tools to solve a given problem and/or generate insights from the data collected.

16. Topic Outline and Schedule:

Unit	Topic	Teaching (T), Learning (L), Week (W)	ILOs	ABET SOs	Assessments
1	**Revision: Data Communication and Networking**	**T**: Lecture, Lab exercises and Discussion **L: Chapter 1** **W: 1**	**A1**	**1,2**	**Exams, and Quizzes**
2	**Introduction to IoT:** • Traffic Models • Connectivity • verticals • Use cases and applications	**T**: Lecture, Lab exercises and Discussion **L: Chapter 2** **W: 2**	**A1, B1**	**1,2**	**Exams, and Quizzes**
3	**IoT Architecture:** • IoT Architecture Models • Data Center and the Cloud • Computing: Cloud, Edge, Fog	**T**: Lecture, Lab exercises and Discussion **L: Chapter 3** **W: 3**	**A2**	**1,2**	**Exams, and Quizzes**
4	**IoT Sensors:** • Introduction • Performance Metrics • Smart Sensors • Sensor Fusion • Challenges and Future Directions	**T**: Lecture, Lab exercises and Discussion **L: Chapter 4** **W: 4**	**A1, A2**	**1,2**	**Exams, and Quizzes**
	Hands-On Exercise (W: 5)	**C1, C2, C3**		**1,2**	
6	**Unlicensed Band Wireless IoT** • Zigbee • Bluetooth • WiFi • LoRaWAN	**T**: Lecture, Lab exercises and Discussion L**: Chapter 6** **W: 6**	**A1, B1**	**1,2**	Quiz 1 (Week 6) (Chapters:1-4)

7	**Cellular IoT Technologies:** • Introduction • Cellular IoT Technologies • Practical Use Cases • Modules, Certificates, AT commands	**T**: Lecture, Lab exercises and Discussion **L**: **Chapter 7** **W: 7**	**A1, B1**	**1,2**	**Exams, and Quizzes**
8	**Midterm Exam**		**A1, A2, B1, C1-C3**	**1,2**	
9	**IoT Data Communication Protocols:** • HTTP • MQTT • Other protocols	**T**: Lecture, Lab exercises and Discussion **L: Chapter 9** **W: 9**	**B1**	**1,2**	**Exams, and Quizzes**
10	**IoT and Analytics:** • Data Pipeline • **AI** • **Machine Learning** • Supervised and non-supervised Learning • Deep Learning	**T**: Lecture, Lab exercises and Discussion **L: Chapters 11** **W: 10**	**C3**	**1,2,4**	**Exams, and Quizzes**
	Hands-On Exercise **(W: 11)**	C1-C3		**1,2**	**pop up Coding Quiz** **(Chapters:10, 13 & 14, 18, 20)**
12 & 13	**IoT Security and Privacy:** • IoT Threats • IoT vulnerabilities • IoT Threat Modeling • IoT Privacy Concerns • Examples	**T**: Lecture, Lab exercises and Discussion **L: Chapters 12** **W: 12**	**B2**	**1,2,4**	**Quiz 2:** **(Week 12)** **(Chapters 9 & 11)**
14	**Project Discussion**			**C1-C3, D1, 1,2,4**	
15	**Project Discussion**			**C1-C3, D1,1,2,4**	
16	**Final Exam Week** **(W: 16)**	**All outcomes**		**All SOs**	**Final Exam:** **(All covered material will be included)**

17. Course Policies:

A- Attendance policies:

Deliberate abstention from attending classes and any other similar acts will lead to student deprivation from the course according to the UJ regulations.

B- Absences from exams and quizzes, and timely submission:

- **If you miss the midterm, then a makeup exam will not be provided unless you submit a valid absence excuse, within three days from the midterm, to your lecturer**. This excuse must be signed and stamped from the **UJ hospital** in order to be valid. If your lecturer accepts the excuse, then you will be able to take the makeup. You need to follow up the departmental announcements regarding the makeup date and time. Please note that the lecturer may either accept or reject your excuse based on UJ regulations.
- **No make-ups will be offered for quizzes.**

C- Health and safety procedures:

N/A

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All students in this course **must read and adhere to the University policies on plagiarism and academic honesty posted at** http://registration.ju.edu.jo/RegRegulations/Forms/All_Regulations.aspx

E- Grading policy:

- **Quizzes: 10%: 2 quizzes out of 10, drop the minimum**
- **Project: 10%**
- **Midterm 30%**
- **Final Exam: 50%**

F- Available university services that support achievement in the course:

N/A

G- Statement on Students with disabilities

Students with Disabilities: Students with disabilities who need special accommodations for this class areencouraged to meet with the instructor and/or their academic advisor as soon as possible. In order to receive accommodations for academic work in this course, students must inform the course instructor and/or their academic advisor, preferably in a written format, about their needs no later than the 4th week of classes.

18. Required equipment:

Every student must have a PC connected to the Internet

19. References:

A- Required book(s), assigned reading and audio-visuals:

Textbook: F. John Dian, Fundamentals of Internet of Things, For Students and Professionals, First Edition, ISBN10: 111984729X | ISBN13: 978-1119847298, 2022, Wiley-IEEE Press.

B- Recommended books, materials and media:

- **Amita Kapoor, Hands-On Artificial Intelligence for IoT : Expert Machine Learning and Deep Learning Techniques for Developing Smarter IoT Systems, First Edition, ISBN10: 1788836065, ISBN13: 9781788836067, 2019, Packt Publishing, The Limited**

20. Additional information:

N/A

Date: **Feb. 15th , 2024**

Name of Course Coordinator: **--Dr. Sherenaz Al-Haj Baddar** Signature: ----------

Head of curriculum committee/Department: ---------- Signature: ----------

Head of Department:..... Signature: .....

Head of curriculum committee/Faculty: ---------- Signature: ----------

Dean: ---------- Signature: .....

Copy to:
Head of Department
Assistant Dean for Quality Assurance