Academic Program Specification Form For The Academic

University: University of Anbar
College: College of Computer Science and Information Technology
Department: Computer Science
Date Of Form Completion : 9/6/2024

Signature:
Head of Department: Prof. Dr. Esam Taha Yaseen

Signature:
Dean's Assistant For
Scientific Affairs

Quality Assurance And University Performance Manager Signature :

م.د وليد خالد محمد

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Dean Authentication

TEMPLATE FOR PROGRAMME SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

PROGRAMME SPECIFICATION

This Programme Specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It is supported by a specification for each course that contributes to the programme.

1. Teaching Institution	University of Anbar
2. University Department/Centre	College of Computer Science and Information Technology/ Computer Science Department
3. Programme Title	Computer Science Program
4. Title of Final Award	PhD degree in Computer Science
5. Modes of Attendance offered	The semester system, with students being on campus, full-time, within the face-to-face (day program) method.
6. Accreditation	IAC-Iraqi Accreditation Council
7. Other external influences	N/A
8. Date of production/revision of this specification	5/6/2024
9. Aims of the Programme	

PhD in Computer Science:

1. Develop students' abilities to conduct original and innovative research in the fields of computer science.
2. Preparing academics and researchers capable of leading scientific research teams and directing advanced research.
3. Enabling students to contribute to enriching scientific knowledge and theories in computer science disciplines.
4. Graduating experts capable of developing innovative applications and solutions that contribute to the progress of society.

10. Learning Outcomes, Teaching, Learning and Assessment Methods

A. Knowledge and Understanding

PhD in Computer Science:
A1- Demonstrate a deep and comprehensive understanding of basic and advanced theories and concepts in computer science.
A2- Creating new knowledge through original and innovative research in areas of specialization.
A3- The ability to lead advanced scientific research and contribute to enriching scientific knowledge.

B. Subject-specific skills

PhD in Computer Science:
B1 - Mastering advanced scientific research skills to plan and implement innovative studies.
B2 - The ability to develop new theories and models to solve complex problems in computer science.
B3 - Creating advanced computer solutions and applications to serve society and contribute to scientific progress.

Teaching and Learning Methods

Teaching and learning methods for the doctorate:

• Specialized research supervision: Providing individual research supervision by expert professors to guide students in conducting innovative research.
• Advanced research workshops: holding workshops to discuss complex research issues and exchange scientific expertise.
• Scientific forums and conferences: Encouraging students to participate in scientific forums and conferences to present their research and learn about the latest developments.
• Partial teaching and supervision: Providing students with the opportunity to participate in teaching and supervising master's students to gain advanced academic experiences.
• Self-learning and investigation: enabling students to conduct independent and innovative research in areas of specialization.

C. Thinking Skills

PhD in Computer Science
C1- Developing the spirit of innovation and leadership in finding creative solutions to complex research problems
C2- Developing the spirit of innovation and leadership in finding creative solutions to complex research problems

D. General and Transferable Skills (other skills relevant to employability and personal development) **PhD in Computer Science** D1- Advanced and innovative scientific research skills: the ability to conduct original research and develop new theories. D2- Research leadership and supervision skills: The ability to lead research teams and sponsor new researchers.				

11. Programme Structure (PhD)

Level/Year	Course or Module Code	Course or Module Title	Credit	12. Awards and Credits
PhD 1st Semester		Selected Topics in Information Security	3	PhD Degree Requires (x) credits
		Wireless and Mobile Networks	3	
		Internet of Things	3	
		Metaheuristics	3	
		Research Methodology	2	
PhD 2nd Semester		Network Security	3	
		Data Mining and Big Data	3	
		Deep Learning	3	
		Robotics	3	
		English II	1	

12. Personal Development Planning

Continuous improvement and focus on students to improve processes that increase the degree of achievement of department and college goals. A periodic study is conducted to examine areas of weakness in order to overcome them. Every teacher must work to continuously improve students' performance and write down the problems and obstacles facing students or the educational process within his specialty.

13. Admission criteria .

- Approval of admission requirements for the student in accordance with the regulations of the Ministry of Higher Education and Scientific Research (central admission)
- Personal interview for the department
- Must be fit for medical examination
- Absorptive capacity.

14. Key sources of information about the programme

- Department page on the college website.
- Computer Science Department Guide.
- Some committee meetings from the Ministry of Computer Science Department.

Curriculum Skills Map

please tick in the relevant boxes where individual Programme Learning Outcomes are being assessed

Year / Level	CourseCode	CourseTitle	Core (C) Title or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
PhD 1st Semester		Selected Topics in Information Security	C	✔	✔			✔	✔			✔	✔			✔			
		Wireless and Mobile Networks	C	✔	✔			✔	✔			✔	✔			✔			
		Internet of Things	C	✔	✔			✔	✔			✔	✔			✔			
		Metaheuristics	C	✔	✔			✔	✔			✔	✔			✔			
		Research Methodology	C	✔				✔				✔				✔			
PhD 2nd Semester		Network Security	C	✔	✔			✔	✔			✔	✔			✔			
		Data Mining and Big Data	C	✔	✔			✔	✔			✔	✔			✔			
		Deep Learning	C	✔	✔			✔	✔			✔	✔			✔			
		Robotics	C	✔	✔			✔	✔			✔	✔			✔			
		English II	C	✔				✔				✔				✔			

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	College of CS & IT – University of Anbar
2. University Department/Centre	Computer Science
3. Course title/code	Internet of Things (IoT)
4. Programme(s) to which it contributes	Ph.D. in Computer Science
5. Modes of Attendance offered	Direct
6. Semester/Year	2nd / Ph.D. Course 2023-2024
7. Number of hours tuition (total)	45
8. Date of production/revision of this specification	

9. Aims of the Course

The goal of this course is to introduce the students to modern networking research in IoT and guide them to investigate novel ideas in the area. This course aims to:

- Describe what IoT is and how it works today

- Recognise the factors that contributed to the emergence of IoT

- Design and program IoT devices

- Use real IoT protocols for communication

- Secure the elements of an IoT device

- Design an IoT device to work with a Cloud Computing infrastructure.

- Transfer IoT data to the cloud and in between cloud providers

- Define the infrastructure for supporting IoT deployments

10· Learning Outcomes, Teaching ,Learning and Assessment Methode

A Knowledge and Understanding

A1. Use real IoT protocols for communication

A2. Design an IoT device to work with a Cloud Computing infrastructure.

A3. Transfer IoT data to the cloud and in between cloud providers

A4. Define the infrastructure for supporting IoT deployments

B. Subject-specific skills

B1. Technical writing and oral presentation skills.

B2. Ability to extract information from scientific papers in the area.

Teaching and Learning Methods

- Homework will be distributed during the course. Unless otherwise stated, all homework should be performed individually by students.
- Quizzes and exams.

Assessment methods

- Classroom participation.
- Engagement in semester-long seminars and research projects.
- Exam performance.

C. Thinking Skills

C1. Problem-Solving: Cultivate the skills to identify and define complex problems, generate multiple solutions, and select the most appropriate course of action. This is particularly important for troubleshooting IoT issues and developing novel IoT applications.

C2. Data Analysis: Become proficient in collecting, processing, and interpreting large datasets, as well as using statistical and machine learning techniques to extract insights from IoT data.

C3. Creativity and Innovation: Encourage out-of-the-box thinking to develop novel IoT solutions that address unmet needs or improve existing ones. This may involve exploring emerging technologies, prototyping, and iterative design.

C4. Interdisciplinary Collaboration: Develop the ability to work effectively with professionals from diverse backgrounds, such as computer science, electrical engineering, and domain-specific experts, to tackle complex IoT challenges.

D. General and Transferable Skills (other skills relevant to employability and personal development)
D1. Time Management and Organization
D2. Project Management
D3. Networking and Collaboration
D4. Teaching and Mentoring

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
Week 1	3		Introduction to IoT, Sensing, Actuation, Basics of Networking.	Theoretical	Assignment and discussion
Week 2	3		Basics of Networking, Communication Protocols.	Theoretical	Quiz
Week 3	3		Communication Protocols, Sensor Networks.	Theoretical	Group work
Week 4	3		Sensor Networks, Machine-to-Machine Communications.	Theoretical	Assignment and discussion
Week 5	3		Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.	Theoretical	Assignment and discussion
Week 6	3		Introduction to Python programming, Introduction to Raspberry.	Theoretical	Assignment and discussion
Week 7	3		Implementation of IoT with Raspberry Pi, Introduction to SDN.	Theoretical	Group work
Week 8	3		SDN for IoT, Data Handling and Analytics, Cloud Computing.	Theoretical	Quiz
Week 9	3		Cloud Computing, Sensor-Cloud. Midterm Exam	Theoretical	Group work
Week 10	3		Fog Computing, Smart Cities and Smart Homes.	Theoretical	Assignment and discussion
Week 11	3		Connected Vehicles, Smart Grid, Industrial IoT.	Theoretical	Quiz
Week 12	3		Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring.	Theoretical	Seminar Presentation
Week 13	3		Student Project Report Presentations 1	Theoretical	Assignment and discussion
Week 14	3		Student Project Report Presentations 2	Theoretical	Seminar Presentation

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	We will not use a dedicated text. The course will be based on lecture content. Some of the course material will be drawn from Prof. Sudip Misra web site, research papers, and text books. We will have video lectures covering the technical topics as well as quizzes and programming assignments.
Special requirements (include for example workshops, periodicals, IT software, websites)	**References:** • William Stallings, *Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud*, Pearson Education, 2016 (ISBN-13: 978-0-13-417539-3; ISBN-10: 0-13-417539-5). • Prof. Sudip Misra, "Introduction to Internet of Things (IoT)" , 2017, https://nptel.ac.in/courses/106105166/. • Pethuru Raj and Anupama C. Raman, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, Taylor & Francis Group, 2017 (ISBN-13: 978-1-4987-6128-4). • Waltenegus Dargie and Christian Poellabauer, *Fundamentals of Wireless Sensor Networks: Theory and Practice*, John Wiley & Sons, 2010 (ISBN 978-0-470-99765-9). **More Useful Reading:** • J. Biron and J. Follett, *Foundational Elements of an IoT Solution*, O'Reilly Media, 2016. • Charles Bell, *Beginning Sensor Networks with Arduino and Raspberry Pi*, Apress, 2013. • Kazem Sohraby, Daniel Minoli, and Taieb Znati, *Wireless Sensor Networks: Technology, Protocols, and Applications*, John Wiley & Sons, 2007 (ISBN 978-0-471-74300-2). • D. Evans, *The Internet of Things: How the Next Evolution of the Internet Is Changing Everything*, Cisco Internet Business Solutions Group, 2011 • Donald Norris, *The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black*, McGraw Hill Education, 2016. • Arshdeep Bahga and Vijay Madisetti, *Internet of Things (A Hands-on-Approach)*, 2014.
Community-based facilities (include for example, guest Lectures , internship , field studies)	

13. Admissions	
Pre-requisites	None

Minimum number of students	2
Maximum number of students	10

COURSE SPECIFICATION

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Anbar- College of Computer Science and Information Technology
2. University Department/Centre	Department of Computer Science
3. Course title/code	Research Methodologies
4. Programme(s) to which it contributes	PhD in Computer Science
5. Modes of Attendance offered	Personal Attendance
6. Semester/Year	First/2023
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	1-9-2023

- Understand the meaning, objectives, motivation, importance, and approaches of research
- Learn about different types of research (basic, applied, quantitative, qualitative, etc.)
- Understand the research process (topic selection, literature review, data collection, analysis, etc.)
- Learn about ethics, professionalism, and social responsibility in research
- Understand the structure and components of a research report/thesis
- Learn how to write and publish a research paper

10. Learning Outcomes, Teaching, Learning and Assessment Methods
A. Knowledge and Understanding A1. Define research and explain its objectives, motivation, and importance. A2. Describe different types of research approaches and methods. A3. Understand the steps involved in the research process.
B Subject-specific skills B1. Ability to select an appropriate research topic and formulate a research problem. B2. Conduct an effective literature review and reference collection. B3. Develop hypotheses and determine suitable research designs.
Teaching and Learning Methods
Class Lectures.
Assessment methods
Exams and Assignments.
C. Thinking Skills C1. Critically analyze research articles and literature. C2. Evaluate and interpret research data and findings. C3. Synthesize information from multiple sources.
Teaching and Learning Methods
Class Lectures.
Assessment methods
Exams and Assignments.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Effective written and oral communication skills.
D2. Time management and project execution skills.
D3. Data management and organizational skills.
D4. Ethical and professional conduct in research.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	Understanding the meaning of research	What is Research (Meaning of Research) - Objectives of Research - Motivation of Research	Lecture	Assignment
2	2	Understanding the meaning of research	What is Research (Meaning of Research) - Thesis Research - Importance of Research - Approaches of Research	Lecture	Assignment
3	2	Understanding the types of research	Types of Research - Basic Research - Applied Research	Lecture	Assignment
4	2	Understanding the types of research	Types of Research - Normal and Revolutionary Researches - Quantitative and	Lecture	Assignment

			Qualitative Methods - Other Types of Research		
5	2	Understanding the research process life cycle	Research Process Selection of a Research Topic and Problem - Can a Researcher Choose a Topic by Himself? - Identification of a Research Topic and Problems - Definition and Formulation of a Problem - What Makes a Good Proposal? - Reasons Why Research Proposals Fail	Lecture	Assignment
6	2	Understanding the research process life cycle	Research Process - Effective Time Management - Literature Survey and Reference Collection - Development of Working Hypothesis	Lecture	Assignment
7	2	Understanding the research process life cycle	Research Process - Determining Sample Design - Collecting the Data	Lecture	Assignment

			- Data Management and Backups - Executing the Project		
8	2	Understanding the research process life cycle	Research Process - Data Analysis' - Hypothesis Test - Results and Conclusions	Lecture	Assignment
9	2	-	Exam	-	-
10	2	Understanding the research ethics	Ethics and Professionalism in Science - What are 'Scientific Ethics'? - Fraud (Plagiarism) - Authorship	Lecture	Assignment
11	2	Understanding the research ethics	Ethics and Professionalism in Science - Intellectual Property and Fair Use - Professionalism - The Social Responsibility of the Scientist	Lecture	Assignment
12	2	Understanding the layout of PhD thesis	Layout of PhD Thesis - Preliminary Pages - Main Text - Introduction. - Actual Research Work Performed and the Findings.	Lecture	Assignment
13	2	Understa	Layout of PhD	Lecture	Assignment

		nding the layout of PhD thesis	Thesis - Summary and Conclusion - End Matters - Appendices - Citation References/Bibliography		
14	2	Understanding how to write a research paper	Writing a Research Paper - What is Research Paper or Article? - Why Should a Researcher Report his Findings?	Lecture	Assignment
15	2	Understanding how to write a research paper	Writing a Research Paper - Research Paper Structure. - Finding a Proper Place to Publish the Research Work.	Lecture	Assignment

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	· Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, John W. Creswell, Sage Publication, Inc., Sixth Edition, **2022**. · *Research Methodology: An Introduction, Lecture Notes*.
Special requirements (include for example workshops, periodicals, IT software, websites)	-

Community-based facilities (include for example, guest Lectures, internship, field studies)	-

13. Admissions	
Pre-requisites	None
Minimum number of students	3
Maximum number of students	25

TEMPLATE FOR COURSE SPECIFICATION

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	College of CS & IT – University of Anbar
2. University Department/Centre	Computer Science
3. Course title/code	Network Security
4. Programme(s) to which it contributes	Ph.D. in Computer Science
5. Modes of Attendance offered	Direct
6. Semester/Year	2nd / Ph.D. Course 2023-2024
7. Number of hours tuition (total)	45
8. Date of production/revision of this specification	5/6/2024

9. Aims of the Course

- To provide students with a solid technical introduction to network security.

- To enable the students to understand what are the common threats faced by various network systems today.

- To know what are the basic principles and techniques when designing a secure networking system and how to think adversarially.

- To learn how today's cybersecurity attacks and defenses work in practice.

10· Learning Outcomes, Teaching, Learning and Assessment Methods

A. Knowledge and Understanding

A1. Familiarity with scientific challenges in network security.

A2. Increased sensibility to privacy issues, anonymity requirements, and related protection/anonymization techniques.

A3. Explain the requirements of real-time communication security and issues related to the security of web services.

A4. Develop network security policies and specify procedures for recovery from attacks on networks.

B. Subject-specific skills

B1. Ability to extract information from scientific papers in the area.

B2. Technical writing and oral presentation skills.

B3. Explain the requirements of non-real- and real-time network security.

B4. Knowledge of the ways to provide privacy, source authentication, message integrity, non-repudiation, proof of submission, proof of delivery, message flow confidentiality, and anonymity.

Teaching and Learning Methods

- Assignments of various chapters should be performed individually by students.
- Homework will be distributed during the course. Unless otherwise stated, all homework should be performed individually by students.
- Quizzes and exams.
- Seminar presentations based on state-of-the-art knowledge.

Assessment methods

- Classroom participation.
- Engagement in semester-long seminars and research projects.
- Exam performance.

C. Thinking Skills

C1. Maintaining scientific honesty.

C2. Achieving academic rigorousness.

C3. Personal integrity and work ethics.
C4.

Teaching and Learning Methods

- Programming projects will be assigned to students. Usually, these can be done based on student groups to be formed during the course.
- Relating the course material to practical societal needs.
- Offering bonuses to student achievements.

Assessment methods
- Doing the required tasks within the specified deadlines.   - Following the course discipline and academic integrity.   - Evaluating the student response in various exams and seminars.

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Development of the skills of using the LANs, WANs, Internet, and intranets efficiently.

D2. Development of the skills of using multimedia and cellular technology securely.

D3. Development of the skills of academic debate and critical thinking.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1st	3	Familiarity with basic concepts	Course introduction. An overview of information security: confidentiality, integrity, and availability	Theoretical	Assignment and discussion
2nd	3	Crypto. understand	Foundations of cryptography: The focus of the foundations of cryptography, One-way functions, and Public-key cryptography.	Theoretical	Quiz
3rd	3	Dealing with Security Models	Internet Protocols and Architecture	Theoretical	Group work
4th	3	Dealing with modern tech.	Network Access Control: IEEE 802.1X Port-Based Network Access Control	Theoretical	Assignment and discussion
5th	3	Dealing with modern tech.	Cloud Computing: Services, Architectures, Implementations	Theoretical	Assignment and discussion
6th	3	Dealing with Security Models	Cloud Security: Cloud Security Risks and Countermeasures, Cloud Security as a Service	Theoretical	Assignment and discussion
7th	3	Dealing with modern tech.	Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS	Theoretical	Group work
8th	3	Dealing with modern tech.	Secure Shell (SSH)	Theoretical	Quiz
9th	3	Dealing with Security Models	Wireless Network Security: Wireless Security, Mobile Device Security	Theoretical	Group work
10th	3	Dealing with modern tech.	IEEE 802.11i Wireless LAN Security	Theoretical	Assignment and discussion
11th	3	Dealing with modern tech.	IoT Security: Challenges, Architectures, Implementations	Theoretical	Quiz
12th	3	Scientific involvement	Student Presentations Session 1	Theoretical	Seminar Presentation
13th	3	Dealing with modern tech.	Electronic Mail Security: Internet Mail	Theoretical	Assignment and discussion

			Architecture, Email Threats, S/MIME, Pretty Good Privacy		
14th	3	Scientific involvement	Student Presentations Session 2	Theoretical	Seminar Presentation
15th	3	Dealing with Security Models	IP Security: IP Security Policy, Encapsulating Security Payload, Combining Security Associations	Theoretical	Group work

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	▪ William Stallings, Network Security Essentials: Applications and Standards, Sixth Edition, Pearson, 2017. ▪ William Stallings, Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson, 2017.
Special requirements (include for example workshops, periodicals, IT software, websites)	• William Stallings and Lawrie Brown, Computer Security Principles and Practice, Third Edition, Pearson, 2015. • Mark Stamp, Information Security Principles and Practice, John Wiley & Sons, 2006. • Imad M. Abbadi, Cloud Management and Security, John Wiley & Sons, Ltd., 2014. • Chwan-Hwa Wu and J. David Irwin, Introduction to Computer Networks and Cybersecurity, Taylor & Francis Group, LLC., 2013. • Recent research papers assigned for students during the course • https://www.youtube.com/channel/UCik8LckJdwOhPogj-AvE-Vg • http://williamstallings.com/
Community-based facilities (include for example, guest Lectures, internship, field studies)	

13. Admissions	
Pre-requisites	None
Minimum number of students	2
Maximum number of students	10

COURSE SPECIFICATION

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1. Teaching Institution	University of Anbar
2. University Department/Centre	Computer Sciences
3. Course title/code	Data Mining & Big Data
4. Programme(s) to which it contributes	Ph.D.
5. Modes of Attendance offered	Regular Attendance with Datashow
6. Semester/Year	2nd Course/ 2024
7. Number of hours tuition (total)	3 hours Theoretically.
8. Date of production/revision of this Specification	9-6-2024

9. **Aims of the Course**

After completing this course, the following objectives can be achieved:

1. To understand advanced concepts and technologies of mining association rules, cluster analysis, and classification techniques.
2. Understand other concepts like: time series data mining, sequence pattern mining.
3. Also, the objective is to provide a basic understanding of data analysis using statistics and to use computational tools on problems of applied nature.
4. To provide an overview of Big Data. It presents the main concepts, theories and applications of Big Data.
5. To critically explore various tools and techniques that can deal and process extremely large volumes of data with varying structures

10· Learning Outcomes, Teaching ,Learning and Assessment Methode
Knowledge and Understanding A1. Data Mining Methodologies A2. Understanding of data analysis using statistics A3. use computational tools on problems A4. Visualization. A5.Measurments. A6.Different Applications.
B. Subject-specific skills B1.Proplem Solving. B2.Knowelge Discovery. B3.Markiting Applications.
Teaching and Learning Methods
Teacher-Centered Approach to Learning Student-Centered Approach to Learning with reports (small projects).
Assessment methods
Periodic exercises and duties. Reports Quizzes Mid Term Exam. Final Exam.
C. Thinking Skills C1. The ability to interpret information logically, C2.Make informed decisions based on comprehensive analysis, C3. In addition to the ability to find creative solutions. C4. Provides flexibility to meet practical challenges.
Teaching and Learning Methods
Redundant
Assessment methods
Redundant

D. General and Transferable Skills (other skills relevant to employability and personal development)
 D1- It promotes intellectual independence and the formation of one's own opinions to evaluate information critically and distinguish between facts and opinions.
D2 Encouraging innovation and creativity, looking at problems from different angles, and finding unconventional solutions.
D3- Enhancing self-confidence and self-esteem.
D4- Achieving excellence and success in a dynamic work environment.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1 & 2	3 + 3	A1,B1,C1	Basic Data Mining Concepts, Data Representation and Visualization.	Teacher-Centered Approach	Periodic exercises and duties.
3 & 4	3 + 3	A2,B2,C2	Association Rule Discovery and Sequential Pattern Discovery. Advanced Pattern Mining.	= =	Quizzes
5 & 6	3 + 3	A3,B3	Classification techniques, Cluster analysis	= =	Periodic exercises and duties.
7 & 8	3 + 3	A4,C3	Outlier Detection	= =	Quizzes
9 & 10	3 + 3	A5,C4	Big data concepts and its types	Student-Centered Approach to Learning with reports (small projects).	Mid Term Exam.
11 & 12	3 + 3	D1,D2,D3	Performance Evaluation: ROC Curves, Confusion Matrix.	= =	Reports
13 & 14	3 + 3	A6,B4,D4	Commercial, educational and medical applications of big data.	= =	Reports

12. Infrastructure

CORE TEXTS COURSE MATERIALS OTHER	1. Introduction to Algorithms for Data Mining and Machine Learning, Xin-She Yang Middlesex University School of Science and Technology London, United Kingdom, Copyright © 2019 Elsevier Inc. All rights reserved.
	2. Big Data Analytics: Systems, Algorithms, Applications, C. S. R. Prabhu • Aneesh Sreevallabh Chivukula • Aditya Mogadala • Rohit Ghosh • L. M. Jenila Livingston, © Springer Nature Singapore Pte Ltd. 2019.
Special requirements (include for example workshops, periodicals, IT software, websites)	1. Programming Languages: Proficiency in programming languages such as Python or R for data preprocessing, algorithm implementation, and result analysis. 2. Data Analysis Tools: Utilize data analysis tools such as Pandas, NumPy, and Scikit-learn for data manipulation, statistical analysis, and machine learning model development.
Community-based facilities (include for example, guest Lectures , internship , field studies)	DATA MINING Concepts, Models, Methods, and Algorithms, THIRD EDITION Mehmed Kantardzic, Copyright © 2020 by The Institute of Electrical and Electronics Engineers, Inc. All rights reserved. Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

13. a)Admissions	
Pre-requisites	Initial information about Data Warehouse & Data Mining.
Minimum number of students	4
Maximum number of students	10

13. b)Course development plan
The current course is being developed by providing deep analytical solutions to confront the medical, educational, and economic problems that government institutions suffer through proposals for that.

COURSE SPECIFICATION

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This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Anbar
2. University Department/Centre	College of Computer Sciences and IT Department of Computer Science
3. Course title/code	Deep Learning
4. Programme(s) to which it contributes	PhD in Computer Science
5. Modes of Attendance offered	
6. Semester/Year	2023-2024
7. Number of hours tuition (total)	3 hours
8. Date of production/revision of this specification	10\1\2024

9. Aims of the Course

This course aims to present the core fundamentals behind the much talked about field of Deep Learning. We will delve into selected topics of Deep Learning, from discussing basics of neural networks, to understanding how CNN and RNN works with common examples and publicly available datasets. Special highlight of the course is the lecture on Interpretability of Neural Networks which will help students to understand how to trust a neural network's recommendation. In the final weeks of the course, we shall get an introductory exposure to Generative Adversarial Networks and Reinforcement Learning which will help build the foundation for more advanced courses in Artificial Intelligence.

10· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Knowledge and Understanding
    A1. Understanding of how shallow NNs and deep NNs work from a
        mathematical
     A2. Understand the theory behind the technologies of CNNs, RNNs, and
        Generative Models
    A3. Hands-on exercises with CNNs, Long Short-Term Memory (LSTM),
    Autoencoders, and Generative Adversarial Networks (GANs)
    A4. Learning to deploy and update ML/DL models in industry
    A5. Practical examples to better understand the mathematical concepts

B. Subject-specific skills
B1. Problem Solving: Use a range of approaches to critically analyze and
    evaluate practices of operating systems in identifying, defining and solving
    problems by using alternative effective and efficient algorithms.
B2. Use data preprocessing skills to load data appropriately for use in models.
B3. Develop a neural network using PyTorch and write a training loop that trains
    the model with the loaded data.
B4 Apply advanced training techniques to improve accuracy on the test set.

Teaching and Learning Methods
- Lecture - Class Discussion - Independent Learning
Assessment methods
- Oral Participation - Quiz - Test - Assignment

C. Thinking Skills
C1. Analytic: Critically analyze and evaluate the performance and effectiveness
    of CNN and RNN
C2. Creative: Extend knowledge in deep learning to construct specific and
    effective solution

D. General and Transferable Skills (other skills relevant to employability and personal development)
 D1. Communication: Show ability to communicate information in appropriate oral and written forms
 D2. Organizational and Developmental Skills: Demonstrate ability to organize ideas and effectively allocate time in given assignment

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3		Brief introduction to Deep Learning (DL), Potential student projects, Differences from Machine Learning (ML), Evolution of ML and DL, Importance of Artificial Neural Networks (ANNs)	- Lecture PPT Slides - Discussion	
2	3		Shallow ANNs, Single layer, Multi-layer, Perceptron Rule, Gradient Descent, Backpropagation, Loss Functions, Hyperparameter tuning	- Lecture PPT Slides - Discussion	Oral Participation Quiz Assignment
3			Deep ANNs and Regularization, Optimization Algorithms, Batch Normalization, Practical Aspects, DL Pipeline and Strategy	- Lecture PPT Slides - Discussion	Oral Participation
3-5			Convolutional Neural Networks, ConvNets, Edge Detection, Padding, Convolution Operator, CNN architecture, Parameter Sharing, Object Localization and Detection, Le-Net, AlexNet, VGG, Residual Networks, Inception Net	- Lecture PPT Slides - Discussion	Oral Participation Quiz Assignment
6-8			Recurrent Neural Networks (RNN), Sequence Modeling, Building the RNN, Backpropagation through time, LSTM, Attention Networks, Natural Language Processing, Word Embedding Applications	- Lecture PPT Slides - Discussion	Oral Participation Quiz Assignment
9-10			Generative Models – Restricted Boltzmann Machines and Deep Belief Networks	- Lecture PPT Slides - Discussion	Oral Participation Quiz Assignment

11			Generative Models – Autoencoders, Variational, Stacked, Denoising	- Lecture PPT Slides - Discussion	Oral Participation Quiz
12-13			Generative Models – Generative Adversarial Networks	- Lecture PPT Slides - Discussion	Oral Participation Assignment
14			Miscellaneous Topics – Capsule Networks, Convolutional LSTM, One Shot Learning, Siamese Networks, Triplet Loss, Graph CNN	- Lecture PPT Slides - Discussion	Oral Participation
15			Final Exam		

12. Infrastructure	
Required reading: CORE TEXTS COURSE MATERIALS OTHER	- Wani, M. A., Bhat, F. A., Afzal, S., & Khan, A. I. (2020). Advances in deep learning. Springer. - https://www.deeplearningbook.org/ - Book: http://neuralnetworksanddeeplearning.com/ • Deep Learning with Python, by Francois Challet, Manning Publications - Introduction to Machine Learning by Ethem Alpadyn (latest edition)
Special requirements (include for example workshops, periodicals, IT software, websites)	Skills in Python programming language
Community-based facilities (include for example, guest Lectures , internship , field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

COURSE SPECIFICATION

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Anbar
2. University Department/Centre	Computer Science
3. Course title/code	Robotics
4. Programme(s) to which it contributes	PhD
5. Modes of Attendance offered	Class Attendance
6. Semester/Year	Second Semester
7. Number of hours tuition (total)	45
8. Date of production/revision of this specification	10 – 06 - 2024
9. Aims of the Course	

Demonstrate an understanding of the objectives and difficulties of robot problems.
Demonstrate an understanding of robot hardware.
Demonstrate an understanding of fundamental principles of robot sensors and algorithms.
Demonstrate an understanding of robots representation in space.
Explain robot control approaches.
Explain robot localization and navigation.

10. Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Knowledge and Understanding
  A1. Overview and motivation
  A2. Robots fundamental problems
  A3. Robot hardware
  A4. Visual and non-visual sensors and algorithms
  A5. Representation and reasoning about space
  A6 . Robot control, localization and mapping

B. Subject-specific skills
 	
  B1. Development the student robot simulation skills
  B2. Development the student robot mathematical building and analysis skills
  B3. Development the student robot programming skills

Teaching and Learning Methods
- Lectures - Assignments - Explanation tools
Assessment methods
- Exams - Reports - Class work

C. Thinking Skills
  C1.
  C2.
  C3.
  C4.

Teaching and Learning Methods
Assessment methods

D. General and Transferable Skills (other skills relevant to employability and
   personal development)
   D1.
   D2.
   D3.
   D4.

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3		Introduction to robot	Lectures	
2	3		Robot fundamental problems	Lectures	
3	3		Robot hardware I	Lectures	
4	3		Robot hardware II	Lectures	
5	3		Non-visual sensors and algorithms	Lectures Videos	
6	3		Visual sensors and algorithms	Lectures Videos	
7	3		Robot representation in space I	Lectures Videos	
8	3		Robot representation in space II	Lectures Videos	
9	3		Assignment review	Report	
10	3		Robot control I	Lectures Videos	
11	3		Robot control II	Lectures Videos	
12	3		Midterm Exam	Lectures Videos	
13	3		Robot localization and mapping I	Lectures Videos	
14	3		Robot localization and mapping II	Lectures Videos	
15	3		Assignment exam	Exam	

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	*omputational Principles of Mobile Robotics, Gregory Dudek, Micheal Jenkin, Cambridge University Press, 2010*

Special requirements (include for example workshops, periodicals, IT software, websites)	
Community-based facilities (include for example, guest Lectures , internship , field studies)	

13. Admissions	
Pre-requisites	
Minimum number of students	
Maximum number of students	

COURSE SPECIFICATION

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Anbar- College of Computer Science and Information Technology
2. University Department/Centre	Department of Computer Science
3. Course title/code	English Language Level 3
4. Programme(s) to which it contributes	PhD in Computer Science
5. Modes of Attendance offered	Personal Attendance
6. Semester/Year	2nd Semester- PhD
7. Number of hours tuition (total)	30
8. Date of production/revision of this specification	
9. Aims of the Course	
a. For the student to become familiar with the most important basic skills for acquiring the English language	
B. The student understands the components of the sentence	
C. For the student to know how to build a sentence	
D. That the student can build correct linguistic sentences and read	

Teaching and Learning Methods
1.Theoretical lectures 2. Laboratory practical lectures. 3.Practical training. 4. Practical activities.
Assessment methods

1	midterm exam (1)
2	midterm exam (2)
3	Activity
4	final exam

C- Emotional and value goals

C1- The student should distinguish between parts of speech and sentence divisions

C2- That the student can understand the sentence and the meanings of the words from the context

C3- The student should differentiate between the different additions at the beginning and end of a word

C4- That the student concludes a summary of the pieces he reads

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1- The student should distinguish between parts of speech
D2-The student should analyze the sentence according to the parts of speech
D3- The student should read the various sections in the methodological book
D4- The student should infer synonyms related to the pieces he read, according to the context

11. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2		Education and Learning	Lectures	Exam + activity
2	2		Innovations in health and medicine	Lectures	Exam + activity
3	2		Writing and reading ESP compositions	Lectures	Exam + activity
4	2		Urban planning	Lectures	Exam + activity
5	2		Water, food, and energy	Lectures	Exam + activity
6	2		First test	Lectures	Exam + activity
7	2		Free trade and fair trade	Lectures	Exam + activity
8	2		Conserving the past	Lectures	Exam + activity
9	2		Wonders of the modern world	Lectures	Exam + activity
10	2		Olympic business	Lectures	Exam + activity
11	2		Second Test	Lectures	Exam + activity
12	2		Trends	Lectures	Exam + activity
13	2		Communications and technology	Lectures	Exam + activity
14	2		Writing and reading ESP compositions	Lectures	Exam + activity
15	2		Oral Test	Lectures	Exam + activity

12. Infrastructure

Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER			
	Book Title	**Author**	**Source**
	Headway Academic Skills Level 3	Sarah Philpot and Lesley Curnick	Textbook

Special requirements (include for example workshops, periodicals, IT software, websites)	

Community-based facilities (include for example, guest Lectures , internship , field studies)	