



ABDULLAH AL SALEM UNIVERSITY (AASU)

Graduate Academic Programs

Data Science and Artificial Intelligence

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General Introduction

Abdullah Al-Salem University (AASU) proudly offers Master's programs that align closely with Kuwait's Vision 2035, across three distinguished colleges: the College of Engineering and Energy, the College of Computing & Systems, and the College of Business and Entrepreneurship. Rooted in a tradition of academic excellence and driven by a commitment to innovation, these programs are designed to equip students with the knowledge, skills, and experience needed to excel in their chosen fields.

In the College of Engineering and Energy, students engage in rigorous coursework and groundbreaking research, guided by esteemed faculty members who are experts in their respective disciplines. With access to state-of-the-art laboratories and research facilities, students have the opportunity to explore emerging technologies and tackle complex engineering challenges. From renewable energy to sustainable infrastructure, graduates emerge prepared to lead the way in shaping the future of engineering and energy solutions.

Meanwhile, in the College of Computer & Systems Engineering, Abdullah Al-Salem University empowers students to thrive in the digital age. Through a blend of theoretical instruction and hands-on practice, students delve into the latest advancements in computer science, artificial intelligence, and information systems. With access to cutting-edge computing facilities and research centers, students collaborate with faculty members on innovative research projects and gain valuable industry insights. Graduates emerge with the skills and expertise to drive technological innovation and address the complex challenges of our interconnected world.

In the College of Business and Entrepreneurship, Abdullah Al-Salem University fosters a culture of creativity, innovation, and enterprise. Our Master's programs provide students with a comprehensive understanding of business principles, coupled with practical experience and real-world application. Through internships, case studies, and entrepreneurial projects, students develop the skills needed to thrive in a competitive business environment. With access to cutting-edge research centers and entrepreneurial incubators, graduates emerge as agile thinkers and visionary leaders, prepared to make a lasting impact in the global marketplace.

The Vision

AASU shall be an institution of choice that will contribute to the socio-economic development of Kuwait by promoting innovation in education, world-class research, creativity, and entrepreneurship.

The Mission

To establish strong and balanced academic programs, research, and outreach programs, that contribute to the development and advancement of Kuwait and the region.

Programs' Development

AASU has meticulously crafted its academic programs in accordance with the comprehensive framework portrayed by Kuwait Vision 2035. These programs are tailored to meet the dynamic demands of the contemporary job market, informed by extensive research conducted by prominent institutions such as the Supreme Council for Planning and Development (SCPD), the Kuwait Foundation for the Advancement of Sciences (KFAS), and the World Bank. Moreover, the university has conducted thorough analyses of requisite skill sets for the workforce, drawing insights from research conducted by the Kuwait Institute for Scientific Research (KISR) and consultations with key stakeholders from both the public and private sectors.

The curriculum of AASU's programs is enriched by a diverse range of specializations, fostering a multidisciplinary approach that aligns with Kuwait's broader educational objectives. Furthermore, the university is committed to enhancing its regional and global presence within academic circles. Through these concerted efforts, Abdullah Al-Salem University ensures that its programs are not only forward-thinking but also responsive to the evolving needs of the modern world.

Graduate Attributes

AASU is dedicated to cultivating the following set of attributes that empower graduates to excel in their academic pursuits and thrive in their professional endeavors:

- Job-ready professionals who can quickly contribute to their workplace by applying acquired core concepts and skills to relevant job fields.
- Creative thinkers and problem solvers who can use their intellectual curiosity and critical thinking to find sustainable solutions to complex, real-life problems.
- Effective collaborators who can communicate professionally, adapt, debate, and act as team players.
- Entrepreneurial individuals who can identify an opportunity and transform concepts into reality.
- Responsible global citizens and lifelong learners who can act in a manner that promotes professionalism, ethical behavior, accountability, and social responsibility, and engage in a self-motivated pursuit of knowledge for either personal fulfillment or professional growth.

College of Computer & Systems Engineering

Graduating with a Master of Science (M.Sc.) in this field necessitates the successful completion of a total of 33 credit hours (CHs). These credit hours are distributed across university, college, and program requirements, encompassing courses that are essential as well as those that can be chosen based on stream preference.

The 33 credit hours are distributed as follows:

- 6 CHs: College requirements (Table 1).
- 9 CHs: Thesis work. (Table 2).
- 9 CHs: Program requirements (Table 3).
- 9 CHs: Program electives (Table 4).

* Thesis defense must be passed before graduation according to working regulations.

* Based on the qualifications of the admitted applicants, additional coursework might be suggested in addition to the program requirements if deemed necessary by the program scientific committee.

Table 1 below shows the list of college requirements courses for the graduate programs at AASU:

Table 1: College requirement coursework (6 CHs).

Course Code	Course Title	Credit hours	Contact hours	Pre-requisite	Co-requisite
CCS501	Analysis and Design of Algorithms	(3 credits)	3		
CCS502	Scientific Research Methods	(3 credits)	3		

Table 2 below shows the list of the thesis requirements for the graduate programs at AASU:

Table 2: Thesis requirements for Graduate Programs at AASU (9 CHs).

Course Code	Course Title	Credit hours	Contact hours	Pre-requisite	Co-requisite
DAI697	Thesis Proposal	(3 credits)	Not specified	Completion of at least 6 credits with a GPA of 2.67 or higher.	CCS502
DAI698	Thesis Continuation	(0 credits)	Not specified	DAI697	
DAI699	Thesis	(6 credits)	Not specified	DAI697 OR DAI698	

Data Science and Artificial Intelligence

Program Overview

The Master of Science in Data Science and Artificial Intelligence Program at AASU offers an advanced curriculum tailored to meet the growing demand for skilled professionals in the fields of data science and artificial intelligence. Through a blend of theoretical foundations and practical applications, students gain expertise in areas such as machine learning, data mining, and predictive analytics. The program emphasizes hands-on experience with cutting-edge tools and technologies, preparing graduates to extract insights from complex datasets and develop innovative AI solutions.

With a focus on interdisciplinary collaboration and industry partnerships, students emerge ready to drive data-driven decision-making and contribute to the forefront of AI innovation.

Program Objectives:

- a. Equip students with advanced knowledge and skills in data science methodologies, algorithms, and tools.
- b. Develop proficiency in artificial intelligence techniques, including machine learning, deep learning, and natural language processing.
- c. Provide hands-on experience with industry-standard software and technologies for data analysis and AI model development.
- d. Foster critical thinking and problem-solving abilities to tackle complex data-related challenges and drive innovation.
- e. Prepare graduates to apply data science and AI techniques across diverse domains, including business, healthcare, finance, and more.
- f. Cultivate effective communication skills to convey insights and recommendations derived from data analysis to stakeholders.
- g. Encourage collaboration and teamwork through interdisciplinary projects and real-world applications of data science and AI.
- h. Promote ethical considerations and responsible use of data in compliance with legal and regulatory standards.
- i. Support lifelong learning and professional development to adapt to evolving technologies and industry trends in data science and artificial intelligence.

Program Requirements

Table 3 below shows the list program course requirements (9 credits) for the graduate programs at AASU in Data Science and AI. With pre-approval from their advisors, students are required to select a minimum of 9 credits from the program's elective coursework, as outlined in Table

4. Additionally, they have the option (with the advisor's pre-approval) to take up to 6 credits from those 9 credits from other programs within the university to fulfill graduation requirements.

Table 3: Program requirements (9 CHs).

Course Code	Course Title	Credit hours	Contact hours	Pre-requisite	Co-requisite
DAI501	Mathematical and Scientific Programming	(3 credits)	3		
DAI502	Data Science	(3 credits)	3		
DAI503	Machine Learning	(3 credits)	3		

Table 4: Program coursework (9 CHs).

Course Code	Course Title	Credit hours	Contact hours	Pre-requisite	Co-requisite
DAI504	Deep Learning	(3 credits)	3	DAI501	
DAI505	Cloud and Big Data Analytics	(3 credits)	3	DAI502	
DAI506	Business Intelligence	(3 credits)	3		
DAI601	Natural Language Processing	(3 credits)	3	DAI501	
DAI602	Reinforcement Learning and Robotics	(3 credits)	3	DAI503	
DAI603	AI in Healthcare	(3 credits)	3	DAI501	
DAI604	Prompt Engineering and Large Language Models	(3 credits)	3	DAI501	
DAI605	Computer Vision and Pattern Recognition	(3 credits)	3	DAI501	
DAI607	Advanced Topics in Data Science and AI	(3 credits)	3	DAI501	

Course Descriptions

College of Computer & Systems Engineering

Course Code: CCS501

Course Title: Analysis and Design of Algorithms

Course Prerequisite: None

Course Co-requisite: None

Course Description: This course delves into advanced techniques for designing and analyzing algorithms to solve complex computational problems efficiently. Topics include advanced data structures, graph algorithms, dynamic programming, greedy algorithms, and approximation algorithms. Emphasis is placed on computational complexity, algorithm optimization, and real-world applications. Students will gain hands-on experience in evaluating algorithm performance and developing solutions for challenging problems, preparing them for research and professional practice in computing.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: CCS502

Course Title: Scientific Research Methods

Course Prerequisite: None

Course Description: This course is designed to equip master's students in computing with advanced knowledge to conduct rigorous, ethical, and impactful research in their field. This course covers the foundational principles of scientific research, including problem formulation, literature review, hypothesis and research question development, experimental design, data collection, analysis, simulation. By the end of the course, students will be prepared to undertake proposal research, contribute to scholarly publications, and address complex computing research challenges.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI501

Course Title: Mathematical and Scientific Programming

Course Prerequisite: None

Course Description: This course aims to equip graduate students with essential programming and mathematical foundations required for advanced studies in Data Science and Artificial Intelligence. The course introduces scientific programming using Python and gains practical skills in using key AI/Data Science libraries. Mathematical concepts crucial to AI and data modeling are covered, including linear algebra, probability, statistics, optimization, and data visualization. Practical assignments will bridge theory and real-world data-driven applications. By the end of the course, students will be able to translate complex mathematical formulations into efficient and reproducible code suitable for advanced data science workflows and AI models.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI502

Course Title: Data Science

Course Prerequisite: None

Course Description: This course focuses on essential data science workflows, from raw data to actionable insights. Students will master techniques for cleaning, preprocessing, and transforming both structured and unstructured data. The course covers exploratory visualization methods, development of ranking/scoring metrics, and implementation of statistical and mathematical models for predictive analytics and data-driven decision making.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI503

Course Title: Machine Learning

Course Prerequisite: None

Course Description: This course offers an in-depth exploration of machine learning principles, algorithms, and practical applications. It covers both foundational and advanced techniques, including supervised learning, unsupervised learning, ensemble methods, and model evaluation. Emphasis is placed on mathematical understanding, algorithmic implementation, and critical analysis of model performance. Through hands-on labs and real-world datasets, students will gain the skills to design, train, and evaluate machine learning models using tools such as scikit-learn, TensorFlow, or PyTorch. The course also touches upon responsible AI practices, including fairness, interpretability, and ethical considerations.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI504

Course Title: Deep Learning

Course Prerequisite: DAI501

Course Description: This course offers a comprehensive exploration of deep neural networks, covering the theory, architectures, and practical implementation for tackling complex AI problems. Students will study the design, training, and evaluation of deep neural networks. Key concepts such as backpropagation, activation functions, optimization algorithms, regularization techniques, and transfer learning are thoroughly covered. The course emphasizes hands-on experience using modern deep learning architectures and frameworks to solve real-world problems in computer vision, natural language processing, and time series prediction. By the end of the course, students will be able to design and deploy scalable deep learning models and critically evaluate their performance.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI505

Course Title: Cloud and Big Data Analytics

Course Prerequisite: None

Course Description: This course introduces scalable data processing and analytics using cloud-based platforms and big data technologies. Students learn the principles of distributed computing, data

storage architectures, distributed machine learning, and data lifecycle management in cloud environments. Emphasis is placed on hands-on experience with building and deploying robust data pipelines, managing big data workflows, and addressing critical considerations such as data governance, security, and cost optimization within cloud environments. The course also explores integration of cloud services for deploying big data solutions and performing large-scale analytics. Through practical labs and projects, students will develop the skills to process massive datasets, perform real-time analytics, and build data-intensive applications that leverage cloud infrastructure efficiently.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI 506

Course Title: Business Intelligence

Course Prerequisite: None

Course Description: This is an applied course where students explore the core concepts of modern Business Intelligence. It covers the design and implementation of data warehouses and data lakes, along with the differences between on-premise and cloud-based data solutions. Students work with real business data to understand how information supports decision-making. A key focus is on data visualization and smart dashboard design, enabling students to present insights in clear, interactive, and impactful ways that support business goals.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI601

Course Title: Natural Language Processing

Course Prerequisite: DAI501

Course Description: This course offers an in-depth study of the theories, algorithms, and cutting-edge models to process, understand, and generate human language. Students will explore fundamental linguistic concepts, statistical NLP techniques, methods for creating dense vector representations of text (e.g., word and sentence embeddings), and advanced deep learning architectures specifically tailored for language, including Recurrent Neural Networks (RNNs/LSTMs) and, with significant focus, Transformer models, and state-of-the-art Large Language Models (LLMs). Emphasis is placed on practical applications, such as text classification, sentiment analysis, named entity recognition, machine translation, question answering, and text generation. The course also covers methods for model evaluation, fine-tuning pre-trained models, and critically addressing ethical considerations and biases in NLP systems. Students will gain hands-on experience applying these techniques using current NLP libraries and frameworks.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI 602

Course Title: Reinforcement Learning and Autonomous Systems

Course Prerequisite: DAI501

Course Description: This advanced course explores the core concepts and methodologies of reinforcement learning (RL) and their application in autonomous systems. Students will study foundational algorithms such as Q-learning, policy gradients, and deep reinforcement learning, gaining insight into how intelligent agents learn optimal behaviors through trial and error in complex environments. The course covers the design and deployment of RL in practical contexts including robotics, autonomous vehicles, and adaptive systems, with a strong focus on simulation-based experimentation and performance evaluation. Learners will develop hands-on skills using relevant toolkits and build applied skills of RL.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI603

Course Title: AI in Healthcare

Course Prerequisite: DAI501

Course Description: This course provides a broad introduction to the use of artificial intelligence in healthcare, with a focus on understanding, interpreting, and critically evaluating medical data. Learners will engage with real-world open-source datasets, including those from intensive care units (e.g., MIMIC) and other clinical domains, to explore how AI models are developed and applied across the healthcare spectrum. Alongside technical skills, the course emphasizes the importance of interpreting model outputs responsibly, understanding data limitations and biases, and addressing ethical considerations such as privacy, consent, and fairness. By the end of the course, students will be equipped with the knowledge to critically assess AI applications in healthcare and contribute to their responsible deployment.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI604

Course Title: Prompt Engineering and Large Language Models

Course Prerequisite: DAI501

Course Description: This course provides an advanced understanding of Large Language Models (LLMs) and focuses on the principles, techniques, and best practices of prompt engineering to effectively use them for complex tasks. Course will explore the underlying architecture and behavior of modern LLMs, master a spectrum of prompting strategies (from zero-shot and few-shot learning to advanced methods like chain-of-thought, tree-of-thoughts, and retrieval-augmented generation), and learn to interact with and control these models programmatically via APIs and agents. Emphasis is placed on designing, iteratively refining, and evaluating prompts for diverse applications including sophisticated text generation, task automation, knowledge extraction, and building LLM-powered applications.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI 605

Course Title: Machine Vision

Course Prerequisite: DAI 501

Course Description: This course introduces the fundamental concepts and techniques in computer vision and pattern recognition, equipping students with the theoretical understanding and practical skills required to analyze and interpret visual data. Topics include image formation, filtering, feature extraction, object detection, motion analysis, and classification. The course also explores statistical and machine learning methods for recognizing patterns in images, including convolutional neural networks (CNNs) and deep learning architectures. Students will engage in hands-on projects involving real-world datasets to develop and evaluate vision-based systems.

Credit Hours: 3

Weekly Contact Hours: 3

Course Code: DAI606

Course Title: Advanced Topics in Data Science and AI

Course Prerequisite: DAI501

Course Description: This course bridges data science and advanced artificial intelligence, emphasizing methodologies to extract insights from complex, real-world data. The course explores recently published emerging architectures and models in data science and AI, focusing on algorithmic and data-driven approaches to address complex, real-world challenges. Topics may include deep reinforcement learning, generative models, and probabilistic machine learning, with applications in computer vision and natural language processing.

Credit Hours: 3

Weekly Contact Hours: 3