



Program Handbook

College	College of Computer Science and IT
Department	Computer Science
Program Title	Master of Science in Artificial Intelligence

2023 (2nd Edition)

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Definitions

The following words and phrases, wherever they appear in these rules, shall have the meanings indicated opposite each unless stated otherwise.

Term	Definition
University	King Faisal University
Student	Any enrolled male or female at the university, regardless of educational level.
Values	Virtuous morals guiding behavior toward goodness.
Objectives	Enhancing ethical competence and self-regulation.
Student Behavior	Actions reflecting students' morals and values, aligning with societal and legal standards.
Violations	Actions or statements violating university rules or public decency.
Disciplinary Penalties	Penalties specified in these rules.
Disciplinary Committee	Committee responsible for student discipline.
National Qualifications Framework	Framework issued by the Education and Training Evaluation Commission on 6/6/1441 AH, subject to updates.
Deanship/Administration/Unit	Entity responsible for academic procedures in graduate studies.
Vice President of the University	Official in charge of graduate studies, per the university structure.
Academic Program	Collection of courses, thesis, or exams required for a degree or higher certificate.
Weekly Theoretical Lecture	Weekly class or seminar lasting at least fifty minutes or specified by a time plan.
Examination	Any test taken by a student, including mid-terms and finals, according to university regulations.
Course	Subject in each program plan, including a code and description, subject to evaluation and may have prerequisites.
Admission Deferral	Pausing a student's enrollment period to obtain a degree after studies commence.
Withdrawal	Student's final termination of enrollment before completing their program.
Enrollment Cancellation	University's termination of a student's enrollment before program completion for specific reasons stated in the regulations.
Re-enrollment	University's reinstatement of a student who has canceled their enrollment.
Comprehensive Exam	Assessment of knowledge and skills required for advanced degrees, possibly serving as a final qualification for some degrees except for a doctorate.
Graduation Project	Research project defined by topic that qualifies a student for their degree and is part of the program.
Thesis	Scientific document representing research and findings submitted for degree attainment.

1 Introduction

This guide provides an essential overview of the Master of Science in Artificial Intelligence (MSAI) program. It includes the structure, components, and contents of the program while highlighting its importance to students. The guide is designed to help students navigate the program and understand how it contributes to their academic and professional growth in the rapidly evolving field of Artificial Intelligence.

2 College of Computer Sciences and Information Technology

The College of Computer Science and Information Technology at King Faisal University is dedicated to advancing knowledge in the fields of computing and technology. It consists of several scientific departments, includes: the department of Computer Science, Computer Information System, Computer Engineering and Computer Network. Each offering a range of undergraduate and postgraduate academic programs.

These programs are designed to equip students with the skills required for the ever-evolving tech industry. The college operates out of Buildings (15) and (59), a state-of-the-art facility that houses classrooms, laboratories, and faculty offices, fostering an ideal environment for learning and research.

3 Department of Computer Science

The Department of Computer Science, located on the second floor of the College of Computer Science and Information Technology building, offers a wide range of programs at both undergraduate and postgraduate levels. The department specializes in areas such as artificial intelligence, machine learning and computer Science. Faculty members within the department come from diverse specializations, contributing to a rich academic and research environment. The department's programs aim to develop students' technical and research skills to meet the growing demands of the tech industry.

4 Master of Science in Artificial Intelligence (MSAI)

The Master of Science in Artificial Intelligence (MSAI) program at King Faisal University is a cutting-edge graduate program designed to equip students with the essential knowledge and skills needed to develop, apply, and manage intelligent systems. In the 21st century, characterized by the fourth industrial revolution, AI is reshaping industries and revolutionizing

fields such as healthcare, finance, autonomous systems, and more. The growing demand for AI expertise underscores the importance of understanding its current applications and future potential.

The MSAI program covers five key areas: Machine Learning, Computer Vision, Intelligent Interaction, Robotics and Agent-Based Systems, and Data Analytics and Knowledge Management. Students are trained through rigorous coursework, hands-on projects, and interdisciplinary collaboration with experienced faculty, preparing them to thrive in the evolving AI landscape.

This forward-thinking program is designed to meet the needs of both academia and industry, ensuring that graduates are well-prepared to pursue careers in AI-related fields or further research. The program's mission, goals, degree structure, admission requirements, learning outcomes, and job prospects are outlined in the following sections.

- **Program Mission**

A graduate specialized in Artificial Intelligence keeps pace with the global development in this field and meets with the need of the local and regional labor market.

- **Program Goals**

The goals of the MSAI program are to prepare the graduate with:

1. Understanding the depth and breadth of the technologies of Artificial Intelligence and identifying the opportunities where these technologies can be applied in the world today.
2. Learning how to use high-level languages and software in order to develop real applications based on AI technologies as well as understanding the problems of implementing such applications in practice.
3. Guiding the proposal of AI-based solutions, considering the ethical and legal aspects and the economic and social implications.

The MSAI program provides the tools to understand how Machine Intelligence works as well as to devise intelligent solutions and smart systems for tomorrow's world thereby ensuring multifaceted career paths for the potential candidates.

- **Degree**

Master of Science in Artificial Intelligence (MSAI)

- **Admission Requirements**

The eligibility criteria for candidates applying for admission to the MSAI program are listed below:

1. Fulfil the conditions stated in the graduate studies rules for Saudi Universities.
2. Have a bachelor's degree, from a recognized university by the Ministry of Education, in any of the following fields:
 - a. Computer Science, Computer Information Science, Computer Engineering, Computer Networks, Information Technology.
 - b. Mathematics, Statistics (with a prior exposure to programming).
 - c. Electrical Engineering, Communication Engineering.
 - d. A related field with a substantial Computing and Mathematics contents.
3. Have a minimum CGPA in the Bachelor degree as 3.75/5.00 or equivalent in the bachelor's degree. It is the decision of the department council to accept less or more than this GPA in line with the university regulations.
4. Demonstrate English language proficiency through one of the followings:
 - a. Scoring 61 or above in Test of English as a Foreign Language Internet-Based Test (TOEFL-iBT), 5.0 in International English Language Testing System (IELTS), or equivalent
 - b. Earning the bachelor's degree with English language as medium of instruction.
5. Provide two letters of recommendation from either faculty at a prospective student's undergraduate institution, or from current employers/managers. If neither is available, applicants will need to provide a clear explanation why this is the case.
6. Provide a letter of approval from the employer if the candidate is currently employed.
7. Pass entrance exam and/or personal interview that will be conducted by the department. It is the department council's decision to add or remove or modify any of the above conditions, if needed, and in line with the university/college regulations.

- **Program Study Plan**

The MSAI program delivers intensive teaching of the fundamentals of artificial intelligence and training in programming through a range of core and elective courses. As well as learning the technical skills required for this rapidly growing area of computing science, you have the chance to explore realistic applications through group and individual projects. During the MSAI program, the student can choose one of the following two tracks:

A. Research Track

B. Course Work Track

Any of these tracks provides students with rigorous training in the theories and applications of machine learning and AI.

A. Research Work Track

The objective of the research track is to provide the students with advanced level of knowledge in AI while developing their ability to work independently as well as enhancing their research skills. As the research track needs some original and creative thinking carrying out a research work and writing a dissertation requires a good grasp of the subject, time commitment and full command of the technical and business writing. Therefore, this option is suitable for those students who are interested in research careers and further research-based learning such as PhD.

The research track includes 36 units distributed according to the course categories, where the learning material is comprised of core courses, elective courses and dissertation, as presented in Table 1. It is to be mentioned that dissertation is compulsory for completion of the MSAI program with research track. Table 2 shows the semester-wise distribution of the courses in this track.

Table 1: MSAI program- Units distribution of research track

Category	Units
Core Courses (4 courses)	12
Elective Courses (5 courses)	15
Dissertation (1 course)	9
Total Units (10 Courses)	36

Table 2: MSAI program- Study plan of research track

Year	1 st Semester			2 nd Semester		
	Course Code	Course Title	Unit	Course Code	Course Title	Unit
1	0911-11660	Foundations of AI	3	0911-11663	Research Methodology	3
	0911-11661	Machine Learning	3	0911-11XXX	<i>Elective Course-1</i>	3
	0911-11662	Programming Tech. in AI	3	0911-11XXX	<i>Elective Course-2</i>	3
	Total		9	Total		9
	3rd Semester			4th Semester		

2	Course Code	Course Title	Unit	Course Code	Course Title	Unit
	0911-1686	Dissertation	3	0911-1686	Dissertation	6
	0911-1XXX	<i>Elective Course-3</i>	3	0911-1XXX	<i>Elective Course-5</i>	3
	0911-1XXX	<i>Elective Course-4</i>	3			
	Total		9	Total		9

B. Course Work Track

The objective of the course track is to provide the students with an advanced level of knowledge in several areas of AI technologies and applications. This objective will be achieved through projects in collaboration with governmental and private industrial institutions, where students will have the opportunity to apply the state-of-the-art techniques they have learned. The objective is to meet the current and future demands of the industry by highly trained artificial intelligence specialists. The course track includes 42 units that comprised of core courses, elective courses and a project, as presented in Table 3. It is to be mentioned that project is compulsory for completion of the **MSAI** program with course track. Table 4 shows the semester-wise distribution of the courses in this track.

Table 3: MSAI program- Units distribution of course work track

Category	Units
Core Courses (4 courses)	12
Elective Courses (7 courses)	21
Project (1 course)	9
Total Units (12 courses)	42

Table 4: MSAI program- Study plan of course work track

Year	1 st Semester			2 nd Semester		
	Course Code	Course Title	Unit	Course Code	Course Title	Unit
1	0911-1660	Foundations of AI	3	0911-1663	Research Methodology	3
	0911-1661	Machine Learning	3	0911-1XXX	<i>Elective Course-1</i>	3
	0911-1662	Programming Tech. in AI	3	0911-1XXX	<i>Elective Course-2</i>	3
				0911-1XXX	<i>Elective Course-3</i>	3
	Total		9	Total		12
2	3 rd Semester			4 th Semester		
	Course Code	Course Title	Unit	Course Code	Course Title	Unit

	0911-1684	Project Proposal	3	0911-1685	Project Implementat	6
	0911-1XXX	<i>Elective Course-4</i>	3	0911-1XXX	<i>Elective Course-7</i>	3
	0911-1XXX	<i>Elective Course-5</i>	3			
	0911-1XXX	<i>Elective Course-6</i>	3			
	Total		12	Total		9

- **Program Learning Outcomes**

The graduates of the Master of Science in Artificial Intelligence (MSAI) program will be able to demonstrate a comprehensive understanding of AI algorithms, apply machine learning techniques in various settings, evaluate Human-AI systems, and address ethical concerns in AI development, as shown in Table 5.

- **Professions/jobs**

The graduates of the program will be able to occupy one of the following positions: Intelligent Systems Developer; Intelligent Systems Engineer; Intelligent Data Analyst; Knowledge Perception Manager; Vision Systems Designer; Vision Systems Engineer; Automated Knowledge Engineer; Intelligent Software Engineer; Machine Learning Robotics Engineer; Robotics Engineer; Intelligent Systems Consultant; Intelligent Secure Software Developer; Machine Learning and Image Analysis Engineer; Machine Learning Developer; Automation Data Scientist; Data Analytics Engineer; Robotic Perception Engineer; Autonomy Engineer; Radar Perception Engineer; Autonomous Vehicle Engineer; Machine Learning Engineer; and Intelligent Solutions Specialist.

Table 5: Program Learning Outcomes for the Master of Science in Artificial Intelligence (MSAI)

Program Learning Outcomes	Description
Knowledge	K1: Demonstrate acquaintance with AI algorithms and processes in areas such as machine learning, data analytics, vision, intelligent interaction, knowledge representation, reasoning, and robotics and agent-based systems.
	K2: Demonstrate awareness of professional and research issues in the AI field, and understand ethical concerns in developing responsible AI solutions.

Skills	S1: Apply machine learning algorithms in technological and industrial settings, especially to draw inferences from data and automate AI system development.
	S2: Use a significant range of skills and representations within AI domains, evaluate their applications, and develop their own solutions.
Competence	C1: Model human behavior, develop Human-AI systems, and evaluate their performance.
	C2: Formalize data-intensive problems in data science and AI using underlying statistical and computational principles.

- **Number of credit hours**

The number of credit hours required to graduate from the program is 36 credit hours for the research track and 42 credit hours for the Coursework track. Students in the Coursework track will complete 1260 learning hours, while those in the Thesis track will have 1080 learning hours, ensuring a comprehensive educational experience in AI.

- **Program Courses**

The study plan for the MSAI program includes six key knowledge areas in intelligent systems, along with foundational concepts in computer science. The main areas of specialization are:

- Machine Learning
- Intelligent Interaction
- Perception and Computer Vision
- Data Analytics and Knowledge Engineering
- Computational Intelligence and Robotics
- Applications of Artificial Intelligence

5 Laboratories and Equipment

The MSAI program is supported by research laboratories equipped with cutting-edge technology and software that operate on multiple operating systems, providing flexibility for various programming and development tasks. Open throughout the week, these AI research laboratories create a suitable environment for hands-on experimentation and project work, accessible to all MSAI students, faculty, and staff.

Faculty members can reserve labs for research projects or workshops, while students may request reservations for collaborative initiatives. The Deanship of Information Technology (DIT) oversees the maintenance and support of laboratory facilities, ensuring a robust infrastructure for AI research.

For additional software needs, equipment borrowing, or technical support, students can contact the MSAI program administration via [Contact us webpage](#) or visit the office on campus. Faculty members submit software requests to the Infrastructure Management Committee, which facilitate the installations for software. For new hardware in research labs, requests are submitted to the Department coordinator, who forwards them to the Planning Department for vendor selection.

Technical support staff maintain lab equipment and handle upgrade and maintenance requests, ensuring that the college is informed when new software and hardware become available for research use.

6 Services Provided By the University

The university provides the student and teaching staff with many educational and non-educational services that the student needs during his educational journey, and these services include the following:

- **The Central Library**

The Central Library is located in Building No. 33 and is open from Sunday to Thursday, 8:00 AM to 8:00 PM. The library includes several sources of information in both hardcopy and digital forms to cover all areas of knowledge and various specializations. The library provides loan services and many electronic services including access to an online catalog. The services provided by the Central Library can be viewed through the following electronic [General Administration of Libraries](#). The library offers access to databases, supports researchers, provides printing and internet services, and promotes self-learning and community service through regular workshops.

- **Medical Polyclinic**

The medical polyclinic is located in building no. 114, Where the Medical Clinics Center provides primary health care including:

A. Healthcare Services

- Patient Diagnosis and Treatment: Medical examinations and treatment for common diseases (diabetes, high blood pressure, asthma).
- Referrals: Coordination of complex cases to Ministry of Health hospitals.
- Pregnancy Care: Gynecological check-ups and advice for mothers.
- Emergency Care: First aid for severe cases until hospital arrival.
- Medical Tests: Conducting necessary tests for disease diagnosis.
- Vaccinations: Childhood vaccinations according to the Ministry of Health program.
- Student Medical Exams: Initial medical assessments for male and female students.
- Health Education: Organizing awareness and educational sessions.
- Driving License Exams: Medical examinations for obtaining a driving license.
- Medical Reports: Preparation of medical documentation.

B. Laboratory Testing Procedures

- Analysis Requests: Conducted based on doctor's requests, with explanations provided by lab staff.
- Sample Submission: Samples accepted in the morning (7:30 AM - 10:00 AM) in designated containers.
- Result Delivery: Test results delivered to patient files at 12 PM or 5 PM; lab staff cannot provide results verbally or over the phone.

C. Sick Leave Policy

- Medical Examination Required: Sick leave granted only after a medical assessment.
- Review of External Sick Leaves: Sick leaves from other parties reviewed by the affiliated college.
- Urgent Medical Excuses: Students must present to the medical committee at least an hour before exams for evaluation.

D. Operating Hours

- Schedule: Sunday to Thursday, 7:30 AM to 4:00 PM.

The services provided by the medical polyclinic can be viewed through the following electronic [link](#)

- **The Deanship of Student Affairs**

The Deanship of Student Affairs is a key support unit at the university, serving as the primary service center for students. It offers a variety of services related to student activities that helps students engaging in the university environment.

A. Services Provided by the Deanship:

- **Housing:** The deanship provides accommodations for university students.
- **Facilities:** The Deanship of Student Affairs building includes a restaurant, student clubs, and a sports hall.
- **Nutrition Services:** Affordable meal options are available for students.
- **Student Activities:** The deanship emphasizes activities that enhance students' skills and personalities, organizing seminars, workshops, and cultural competitions.
- **Hobby Development:** Efforts are made to cultivate and refine students' hobbies through social activities and outdoor trips, encouraging strong interpersonal relationships and healthy social habits.

B. Main Components of the Deanship:

The Deanship of Student Affairs organizes seminars, workshops, and cultural competitions. It is interested in developing and refining students' hobbies. The deanship comprises two main components: the student activities system and the student services system. The student clubs provide diverse activities to explore interests, such as leadership, volunteer work, fine arts, sciences, and sports. The student services system also includes several specialized units like the disability unit, guidance and skill development unit, and the scholarship student care unit that offer additional support. The student fund provides financial assistance through grants and loans, helping students focus on their studies. The scholarship student care unit also offers comprehensive care to students from Gulf region, Arab countries, and Islamic nations during their time at the university as per the regulations.

For more information on the services offered by the Deanship of Student Affairs, please visit: [KFU Student Affairs](#). For guides and regulations, please check this link: [KFU Regulations](#).

7 Services Provided by The Program/College

- **Orientation Programs**

At the start of each academic year, the MSAI program holds an orientation program for new students. This event helps students understand their responsibilities, familiarize themselves with their academic program, and receive guidance on registration procedures. The orientation covers essential topics like college departments, academic programs, university regulations, and e-learning systems like Banner, postgraduate portal and Blackboard. The program encourages students to ask questions, ensuring they have the necessary support and understanding of their responsibilities. Faculty members and advisors are also introduced, offering ongoing academic, social, and psychological guidance throughout the students' time in the program.

- **Student Clubs**

The Student Activities Committee at the College of Computer Science and Information Technology and the MSAI program aims to enhance students' skills and values through diverse educational and recreational activities. It organizes various events, including scientific, athletic, cultural, and entertainment activities. The committee collaborates with the Deanship of Student Affairs, evaluates student events, and manages information related to student clubs. Student clubs in the college include the Programming and Artificial Intelligence Club, Cybersecurity Club, Peer Learning Club, and Google Developers Club. These activities enhance personal development, community engagement, and contribute to a vibrant college life. Students are encouraged to propose new activities through their clubs and interact with the college administration for continuous improvement of student experiences. For additional details on college activities and student clubs, please visit the following link: [College Activities and Clubs](#).

- **Training Programs**

Regular workshops and training sessions are organized to develop students' academic and professional skills. These sessions include topics such as study skills, time management, and industry engagement events, offering opportunities for students to connect with professionals and explore career options. The training programs provide various learning opportunities for students to further their education, including summer school programs that offer specialized educational experiences during breaks. Additionally, the college offers seminars,

workshops, and collaborative research projects for postgraduate students, along with a range of AI courses covering topics such as machine learning, deep generative models, neural networks, and natural language processing.

- **Academic Guidance**

MSAI students benefit from academic guidance provided by qualified advisors. This support includes course and track selection, setting educational goals, and planning academic pathways. Each student is assigned an advisor to assist with academic, social, or psychological needs. Moreover, academic support programs, including tutoring and workshops, are available to help students reach their full potential. For more details about the advising services, please refer to the corresponding Section 10.

8 Registration of The Courses

Each semester, students must register for the courses they intend to take, dependent on successfully passing the previous level and any required prerequisites.

- **Responsible Units**

The following units are involved in the course registration process:

Table 8: Course registration process units and responsibilities

Unit	Responsibilities
The Department	• Specify the courses to be delivered and the number of sections for each course. • Provide support and advice to students. • Manage the registration process.
Academic Advisor	Assist students in course selection and academic planning.
Deanship of Admissions	Oversee the registration process and student admissions.
Deanship of Information Technology	Implement and manage the information technology systems related to registrations.

- **Course Registrations**

Registration will occur through the Banner system, managed by the Registration Department in the Deanship of Admissions and Registration, [Postgraduate program management](#). The process includes the following steps:

- The department council defines the courses to be offered in the upcoming semester.
- Students must register early during the 10th to 12th weeks of the preceding semester, allowing them to confirm, drop, or add courses per the approved study plan within the permissible academic load.
- Students must confirm their registrations for each semester. The confirmation period runs from the end of final exams of the preceding semester until the end of the first week of the new semester. Failure to confirm will result in cancellation of their registration, and they will be considered discontinued from their studies.
- Students can add or withdraw courses during the first week of the semester.
- Students may apply for a postponement of their studies up to two weeks before the semester starts; if not applied for, they will be deemed discontinued from their studies.
- For more information visit postgraduate program management [Registration Guides](#).

- [Academic Procedures](#)

Chapter 8 of [Regulations and Guides](#) details the academic procedures for Saudi universities and their implementation at King Faisal University, emphasizing key articles:

Postponement: Students may postpone studies with department council recommendations and college council approval per Article 22.

Withdrawal: Students may withdraw from courses or all courses after registration, following department recommendations and college dean approval per Article 23.

Re-enrollment: Graduate students who withdraw may face current admission criteria upon reapplication per Article 24.

Withdrawal Status: Students are considered withdrawn if they do not register during the specified periods per Article 25.

Enrollment Loss: Students may lose enrollment if they withdraw per Article 26, fail complementary courses, maintain a GPA below "Very Good" for two semesters, or if admission was based on false information.

Readmission: Students whose enrollment is canceled may be readmitted based on acceptable circumstances. If over three years have passed, they are treated as new students; if three years or less, specific courses must be retaken per Article 27.

Exceptional Opportunities: The college council may grant up to one academic year of exceptional opportunity based on the department council's recommendation per Article 28. The

permanent committee may also grant a similar opportunity based on recommendations per Article 29.

Transfer Policy: The executive administration may accept transfers from licensed institutions if the student was not expelled per Article 30. Students may also transfer between programs based on departmental recommendations per Article 31 and take courses at other universities with credit applicable to their degree per Article 32.

- **Examination and Grading Procedures**

Examinations for postgraduate courses and grade recording will follow the undergraduate study and examination regulations, with specific exceptions related to required passing grades and performance in complementary courses.

A. Exam Regulations:

Students must achieve at least a "very good" grade to be considered successful in a course. Additionally, they are required to pass a remedial course on their first attempt with a "very good" grade and maintain a cumulative GPA of "very good" across all remedial courses. Furthermore, decisions regarding alternative exams and courses that span multiple semesters will be made by the college council based on departmental recommendations.

B. Comprehensive Exams:

The evaluation committee in MSAI program operates on two tracks: coursework and research. In the coursework track, students are evaluated through four assessments if a course project is involved. For the research track, the postgraduate committee monitors progress with supervisors. The university council sets the rules for comprehensive exams, both written and oral, as determined by departments. Students can postpone their exams for one semester based on departmental recommendations, counting against their allowed extensions. A committee is established each academic year to oversee the exams, and students pass if they achieve 70% or higher on both components. Articles [34-35].

C. Research Projects and Supervision

The university council oversees the registration of research projects and theses for graduate students, including the selection of supervisors. To submit a thesis project, a student must complete at least 50% of their coursework with a minimum GPA of "very good". Thesis topics for postgraduate students must be original and contribute to knowledge in their field. Theses must be written in the English language, with a summary in Arabic. Faculty members, including assistant professors with the necessary publications, may supervise graduate research, subject to specific conditions, Articles [36-37].

D. Supervision Standards

Supervisors are mandated to evaluate students' progress at the end of each semester, ensuring consistent monitoring of their development. If a student shows a lack of commitment, they may receive a warning, and after two warnings, their enrollment can be canceled based on departmental recommendations, Articles [38-42].

E. Defense and Evaluation

After a student completes their thesis, the supervisor submits a report to the department chair to initiate the defense process. The university council establishes the criteria for selecting committee members for thesis defenses and outlines the procedures for conducting these defenses, Articles [47-50].

- **Graduation and Degree Awarding**

The department head is required to submit the discussion committee's report to the college dean within two weeks for executive management review. Students are eligible for graduation upon successfully completing program requirements with a minimum GPA of "very good". Furthermore, to obtain a master's or doctoral degree, students must publish at least one research paper from their thesis as the primary author in a peer-reviewed journal, effective from 1/1/1445 AH. Finally, the relevant deputy must present the recommendation for awarding the degree to the university council for approval. Articles [53-56].

A. High Diploma

If a student completes part of a master's or doctoral program but does not qualify for the full degree, the university may award a high diploma or a master's degree based on the completed coursework. This can occur if the student chooses not to continue or faces academic challenges like not meeting the GPA requirement or exceeding the time limit for graduation. Additionally, a certificate of completion may be issued for partial completion of graduate-level courses, as per Article 57.

9 Study Regulations and Tests

- **Study Regulations**

The university follows specific guidelines when validating academic programs, including the national qualification framework in Saudi Arabia, which is based on the decision made by the Education and Training Evaluation Commission on 16/06/1441, Article 4. The MSAI program complies with the university's general study regulations, which include:

- The academic year is structured according to the approved curriculum, allowing for two or more semesters and potentially a summer session, with each academic level consisting of a minimum of four weeks, totaling at least 40 weeks annually (Article 5).
- The university council may adopt various educational styles for programs based on proposals from colleges or institutes, in line with defined criteria (Article 7).
- The curriculum must include at least 10% of courses offered through alternative educational methods besides in-person instruction, subject to university approval (Article 8).
- Students who complete a number of credit hours but do not meet degree requirements may be awarded a diploma, following the established criteria and aligned with the Saudi classification and national qualification framework (Article 10).
- **Tests Regulations**

Chapter 8 of the [Study and Test Regulations](#) details the rules and policies for studies and examinations, which the college enforces in accordance with the university's guidelines.

- The university council sets the grading method, ensuring semester work accounts for at least 30% of the total grade, with varied assessment methods to accurately measure learning outcomes (Article 29).
- The college organizes final exams according to the academic calendar, with strict rules on exam timing and grading oversight by department heads and deans (Article 30).
- Students absent from the final exam receive a zero for that exam, with the overall grade based on semester work (Article 31).
- Students with an acceptable excuse for missing a final exam can take a makeup exam, but failure to do so results in a failing grade (Article 32).
- Incomplete course requirements must be fulfilled by the following term, or an incomplete grade (IC) is replaced with a failing grade (F) (Article 33).
- Research-based courses spanning multiple semesters receive a continuing grade (IP) until completion, or the grade turns into an incomplete (IC) (Article 34).
- Students in full-year programs may be allowed a second-chance exam for failed courses, depending on the number of failed units, before the next academic year (Article 35).
- Students can appeal their final course grade within fifteen days of its finalization, as detailed in the executive regulations. (Article 36).

10 Academic Advising and Counselling Services

Academic advising and counseling services are support systems provided by KFU to help students navigate their academic journey and personal development. These services typically include:

- **Academic Advising:**

Academic advising plays a vital role in guiding students throughout their university education. Its purpose is to support and counsel students in maximizing their potential, developing their skills, and motivating them to achieve academic excellence and innovation. Furthermore, academic advising helps students stay on track to complete their studies and graduate within the designated timeframe. Through this process, students gain valuable academic knowledge and practical skills, preparing them to successfully enter the job market. The academic advising process guides students toward achieving optimal results while helping them adjust to the university environment and take advantage of available opportunities.

In this regard, all staff members share the responsibility for academic advising. Every university professor acts as a mentor to their students, providing guidance and support. Professors should also caution students about potential mistakes and challenges they may encounter in their academic journey. This role extends beyond being the designated advisor assigned by the department, making academic advising a collective duty of all faculty members.

An academic advisor is a faculty member appointed by the CCSIT academic affairs to provide academic guidance to students upon their enrollment in postgraduate programs. The primary duties of an academic advisor include guiding students through their academic journey, selecting a thesis topic, and assisting with the creation of a research plan.

Unified Regulations for University Sciences in Saudi Arabia and its Rules in Action at King Faisal (Article Forty-One): “Each graduate student shall have a scientific advisor at the beginning of their enrollment in the program to guide students in their studies, assist them in choosing the thesis topic, and prepare the research plan in accordance with the rules approved

by the University Council based on the recommendation of the Graduate Studies Deanship Council”.

A. Academic advisor Tasks

The academic advisor mentors students throughout their studies, assisting them in overcoming any challenges or difficulties they may encounter. The academic advisor’s responsibilities include the following:

- Informing students about their rights and responsibilities as outlined in the Unified Regulations of Postgraduate Studies.
- Helping students become acquainted with the university’s academic system.
- Offering students accurate information regarding educational policies and academic programs.
- Improving students' academic performance, enhancing their abilities, and helping them overcome challenges encountered during their studies.
- Alerting students of the academic failure problem and the method to avoid it.
- Offering guidance and support to graduate students dealing with academic challenges.
- Guiding, supporting, and monitoring struggling students to help improve their academic performance.
- Recognizing, encouraging, and promoting the innovations of outstanding and talented students.

To Support Special Need Students (low achievers, disabled, gifted and talented), the revised academic advising process developed by the Academic Advising Committee identifies students who are in trouble based on the progress they have made in the program. Students who do not achieve certain progress toward their degree are placed in 2 sequential zones according to certain criteria: CCSIT Warning zone and KFU Warning and Disqualification zone.

A student is in the CCSIT Warning zone if his/her GPA falls below 3.0. In this case, it is recommended to:

- Hold the student’s record.
- Attend CCSIT advising sessions and seminars.
- Attend counseling workshops and seminars provided by Deanship of Student Affairs.
- Student (based on the academic advisor’s request) meets regularly some/all.

- Mathematics, Programming, and Databases helpdesk to improve their performance.

Outstanding students with high GPA are invited to a special lunch with the Dean, Vice Deans, Program Chairs and Committee Chairs where they are awarded excellence certificates for their exceptional performance in academics.

The college campus is equipped with accessible entrance, restrooms and parking to facilitate **students with disabilities**. Furthermore, on the request of the program chairs / academic affairs, students with disabilities are given additional time in examinations based on the need of the student.

- **General Guidance and Counselling Services:**

The Guidance and Skills Development Unit in the Deanship of Students' Affairs is responsible for providing the students with advice, assistance and a range of specialized developmental, and preventive programs related to academic, social, psychological and educational issues for all students.

A. The Services of the Guidance and Skills Development Unit

- Providing social and family counseling.
- Providing academic and educational consultations
- Providing psychological counseling.
- Providing general consultations related to youth guidance and special needs.
- Providing a set of seminars, workshops and special training programs in related to students' professional development.

The Guidance and Skills Development Service assists students to realise their unique potential and get the most out of their studies and university life. Professional counselling staff respond sensitively to the effects that challenging circumstances can have on individuals. The service helps students to improve their educational progress, and to achieve balance of personal, educational, vocational and social activities in a way that makes them happy and able to direct their own lives with insight and intelligence, in accordance with the principles and standards of Islamic education. The service offers confidential, professional support to explore individual situations and assist in making appropriate choices, as well as promoting an understanding of

psychological and emotional well-being throughout the university ensuring healthy conditions for the growth of individual personalities.

Student Guidance and Counselling is delivered using a set of guiding ways based on religion, free time and reality through:

- Therapeutic counselling sessions-individual and collective
- Directed and undirected reading
- Special Groups
- Lectures and seminars
- Phone calls and self-help information online
- Campaigns and programs build the students values, protect them from some of the risks they face, develop their potential and meet their needs.

B. The Service Helps Students To:

- Recognize the early signs of any emotional and mental health
- Calm themselves down if stress has got the better of them
- Gain a greater sense of relaxation so that anxiety states are not so easily triggered
- Feel more resourceful in the present moment
- Recognize that there is an alternative to the downward spiral of automatic negative thinking which can unwittingly escalate when feeling overwhelmed
- Increase self-esteem and confidence
- Tap into the inner resources they have but don't always recognize, and develop a sense of trust that they can cope with the challenges that life brings

C. Students Receive a Counselling and Pastoral Service That Conforms to An Ethical Framework:

- A service that puts their needs and interests first and treats them with respect and dignity
- An initial appointment (for face-to-face counselling)
- Follow-up appointments and/or referral to other agencies as appropriate.
- A Counselling Service that operates within a specific confidentiality and privacy code irrespective of the information (personal, family, academic etc)
- Use of resources, projects, available materials and various programs to develop themselves without interference and force.

- Choose their own way and style of life and how to achieve their goals in the light of national standards and regulations prevailing in the society
- Enjoyment of the sovereignty of laws and regulations governing the relationship between students and the supervisor working in partnership to ensure the freedom to display information and maintain confidentiality.

Services request feedback from students, for example what aspects of the service helped to meet their needs most effectively or not and hence any ideas to improve the Service. This is achieved by inviting students to complete an Evaluation Questionnaire at the end of a counselling and pastoral session. The questionnaire is anonymous and will not be seen by the counsellor. Students are also informed as to how to complain if they feel they have not had a good service from counsellors.

For More details about Students Guidance and Skills Development [click here](#).

11 Complaints and Grievances

- **The Complaints and Grievances Regulations and Procedures for Students**

An academic complaint or grievance concerning academic issues may involve matters such as admission, grades, academic suspension, misinformation, plagiarism, intentional falsification of information, submitting work completed for one course in another, and copyright infringement.

Non-academic complaints encompass, but are not limited to, harassment (whether verbal or physical), threats, disruptive or abusive behavior on campus, fines, fees, or exclusion from specific services, discrimination, and issues related to access to records or policy violations. KFU upholds a fair policy in its interactions with students and their relationships with administrators, faculty, staff, and other members of the university community. The goal is to establish and implement policies and procedures for addressing both academic and non-academic grievances.

CCSIT typically has established procedures for handling grievance and complaints procedures. These procedures are designed to ensure fairness and transparency, and they provide students with a means to voice their concerns or complaints (Grievance and complaints)

A. Code of Ethics and Professional Conduct

The Code of Ethics and Professional Conduct of KFU is a published agreement that includes a set of ethical principles, professional standards and duties that are agreed upon by all parties of the university. The content of this Code is based on the regulations, systems and public morals in Saudi Arabia. All KFU parties have pledged to adhere this Code in all honesty, honor and integrity and work to transform it into practical practices to contribute to the advancement of the academic and administrative system and ethical performance at the University.

B. Definitions of Academic Misconduct

- *Plagiarism*

Plagiarism is the reproduction or paraphrasing, without acknowledgement, from public or private (that is unpublished) material (including material downloaded from the internet) attributable to, or which is the intellectual property of, another including the work of students. Plagiarism may be of written and also non-written form and therefore would also include the unacknowledged use of computer programs or software, mathematical/computer models/algorithms, macros, spreadsheets, web pages, databases, designs/models/displays of any sort, diagrams, graphs, tables, drawings, works of art of any sort, digital images, computer-aided design drawings, GIS files, photographs, maps, music/composition of any sort, posters, presentations and tracing.

Examples of plagiarism are:

- Intentionally including in a student's submission extracts from another person's work, without explicitly marking the text as a quotation and accrediting the source.
- Intentionally using of the ideas of another person including images and other creative work without acknowledgement of the source.
- Intentionally paraphrasing or summarizing another person's work without acknowledgement.
- Cutting and pasting from electronic sources without explicit acknowledgement of the source of the URL or author and/or without explicitly marking the pasted text as a quotation.
- Submitting a piece of work entirely as a student's own when it was produced in collaboration with others, and not declaring that this collaboration has taken place.
- Intentionally submitting appropriated imagery or creative products without indicating the source of the work.

- *Cheating*

Cheating is any action taken before, during or after an assessment or examination which seeks to gain unfair advantage or assists another student to do so.

Examples of cheating are:

- Gaining access to, or using, unauthorized notes or other material relating to an assessment
- Introducing any information, including electronically stored information, into the examination room unless expressly permitted by the examination or course regulations
- Communicating during an examination with any person outside the examination room or with other students within the examination room
- Copying the work of another student whether in examinations or in other assessments
- Amending and resubmitting work following a final mark being issued in order to gain a better mark.

- *Falsification*

Falsification is any attempt to present fictitious or distorted data, evidence, references, experimental results or other material and/or knowingly to make use of such material.

Examples of falsification are:

- Presenting data based on controlled investigations, experiments, surveys or analysis falsely claimed to have been carried out by you
- The invention of references and/or false claims; including data etc. in your work which you know to be false or incorrect, whether or not this has been created by you.
- In connection with programs leading to a professional qualification, falsely claiming to have completed non-academic requirements such as hours in practice, or to have achieved professional competencies may lead to disqualification to practice.

- *Other breaches of academic integrity*

There may be other breaches of academic integrity which are not specifically referred to above and some breaches may fall into more than one category. Where a member of staff is concerned that a student has submitted work that is substantially different to other work which has been submitted previously the faculty may investigate.

- *Disciplinary breaches*

All students are subject to the disciplinary regulations as defined in the following articles:

- Breaches in the rules, regulations and traditions of the University will be considered a disciplinary offence.
- A student who cheats in an examination will be formally reported by the examination observer to the Dean of the College. The Dean will report the offence through the President of the University or his authorized representative to the Disciplinary Committee who will decide the punishment. A breach of the examination system will be reported by the Dean to the Vice President or his authorized representative to take action.

C. Disciplinary Action

A student who cheats in the examination or initiates cheating, and is caught in the act, is removed from or excluded from the hall by the observer of the exam. The observer or invigilator reports in detail what had happened, and provides documents to the Dean. The Dean delivers the record and documents to the President of the University or his authorized representative to refer an application to the Disciplinary Committee to decide the appropriate punishment.

If a student who cheats in the examination system, then the Dean or his authorized representative has the right to estimate the situation to drive out the student from the exam hall, or allow him to continue according to the case, and the Dean delivers a report to the Vice President or his authorized representative to take the required procedure.

If the student is removed or excluded from the exam hall, the exam becomes void in the course in which he was testing (given fail estimate) and the student's exams are not repealed in other courses except that based on a decision of the Disciplinary Committee. The decision is based on the report of the Dean, and the results of the student are not announced in these courses until a decision of the Disciplinary Committee is issued.

D. Disciplinary penalties are:

1. Written notification.
2. Ultimatum.
3. Deprivation of the enjoyment of some or all of the advantages of university students.
4. Cancellation of the exam of the student in one course or more and is given the estimate (failed).
5. Depriving the student of the exam in one course or more and is given the estimate (failed)

6. Dismissal from the University for a semester or more.
7. Final dismissal from the University.

The decisions of disciplinary penalties reserved in the student's file and as a consequence of final dismissal the student is not to allow to re-register and the decision of the disciplinary penalty may be announced within the University, and the guardian of the student may also be notified.

E. Competent Authorities of Imposing Disciplinary Penalties Are:

1. **The competent Dean:** Has the imposition of penalties (1 and 2) shown in Article (IV) based on the proposal of the competent officials concerning what the students may commit during lectures, tutorials or otherwise.
2. **The President:** Has the imposition of penalties (1,2 and 3) shown in Article (IV) after consulting with the competent Dean, and when referring the student to the Disciplinary Committee he has the right to prevent him from entering the university and its facilities to the day appointed for his appearance before the Committee.
3. **The Disciplinary Committee:** Has the imposition of the penalties mentioned in Article (IV) with taking into account that imposition of the any of the penalties prescribed in this Article shall not be made only after conducting the required investigation.
4. The Disciplinary Committee comprises the relevant Vice President as the Chairman, the Dean of the concerned Faculty, the Dean of Admission and Registration and the Dean of Student Affairs as members. The Secretariat of the Committee shall be managed by one of the legal advisers to university, in the case of the Committee could not be held as previously mentioned, it is constituted by a decision of the University President.
5. A student assigned to the Disciplinary Committee to appear before the committee by the date specified by the Chairman of the Disciplinary Committee by a registered letter to the address indicated in his file or through a letter delivered to him personally.
6. Resolutions issued by the competent authorities to impose Disciplinary Penalties in accordance with Article (V) shall be conclusive and reported to the student or his guardian in writing by a registered letter or delivered to him personally, and without prejudice to the provisions of Article (III), student may appeal to the University Council from the decision of one of the penalties set forth in paragraphs (4, 5, 6 and 7) of Article (IV) and the appeal request should be submitted by the student to the President of the University during the fifteen days of notification of the decision to the student.

F. Appeals of Examination Results, Submitted by University Students

By creating a unit to examine appeals submitted by the students, the University aims to achieve the following:

1. A homogeneous University community in the spirit of mutual cooperation among its employees.
2. Adoption of the principles of justice and equity as a backbone in building a perfect society within the University.
3. Support the rights of students on the basis of laws and regulations, applicable in the University, Support the investigation of appeals and adjudicates on appeals submitted by students to further develop the culture of justice and equity among students.

G. Appeals Submitted to Re-Correct The Answer Sheets:

1. Appeals shall be submitted to the Dean or his/her authorized representative within two weeks from the date of reporting student results.
2. The Dean may accept the application of the student or refuse it.
3. In the case of accepting the application, the College Council shall determine the faculty member who is responsible for the re-correction.
4. After the re-correction of the answer sheet the council will reconsider it and arrive at a decision. The decision of the College Council is final.
5. The College Council has the final decision about student's appeal within a period beyond the start of the final test of the next semester and also in the acceptance or otherwise of the appeal application.

See also:

- Regulation of the Study & Examinations of the University Stage and the Executive Rules of King Faisal University ([click here](#)).
- King Faisal university code of conduct ([click here](#)).
- Students' rights and responsibilities ([click here](#)).
- **The Complaints and Grievances Regulations and Procedures for Teaching Staff**
KFU adopt policies and regulations for discipline, complaints and disputes about or by faculty members and staff, from the "Regulations for Saudi Universities Personnel Including Staff Members and the Like" articles 82 to 91.

A. The responsible Units:

The Disciplinary Committee Initiate the disciplinary action Deanship of Academic affairs complete all the action resulted from the disciplinary.

B. Procedures:

- 2 A Disciplinary Committee looking into the misconduct of staff members or equivalents shall be formed based on a resolution issued by the University Rector.
- 3 If the staff member and the like are believed to have violated any of her/his duties, a dean shall be assigned by the University Rector to conduct an investigation in accordance with the staff disciplinary rules and report the investigation results the University Rector.
- 4 The University Rector may issue a resolution to suspend any staff member and the like pending investigation. The suspension penalty is applied with a maximum of three months except on the basis of a resolution from the Disciplinary Committee.
- 5 The University Rector shall notify the staff member and the like, who is subject to investigation by the Disciplinary Committee, of the charges, and provide her/him with a copy of the investigative report through registered mail fifteen days before the defined date of the disciplinary session.
- 6 The staff member and the like, who is referred to the Disciplinary Committee, may review the minutes of the conducted investigation on the dates defined by the Rector.
- 7 The Disciplinary Committee shall investigate the reported misconduct charges as follows:
 - a) The Committee shall meet upon the President's call, and the member under investigation shall be notified through registered mail to be present before the Committee for hearing and defense.
 - b) The Committee sessions shall be attended by the member under investigation or her/his delegate. However, if neither the member in question nor the delegate is present, the investigation procedures may be carried out but the investigations and examinations shall be carried out in closed sessions. The Committee maintains the right to call witnesses when necessary.
 - c) The Committee's resolutions shall pass on the basis of the majority of votes, and sessions shall not be valid unless attended by all the members. The Committee shall refer the minutes of the resolutions, and the investigation file to the University Rector within a maximum time of two months from the date of referring the investigation to the Committee for approval.
 - d) If the University Rector does not approve of the Committee resolution, the file shall be referred back to the Committee, which, in case of persistence, shall refer the case once more to the University Council, the resolution of which shall be conclusive.

- e) The University Rector shall notify the staff member and the like of the Committee resolution once it is issued in writing.
 - f) The staff member and the like, may file an appeal against the resolution through a letter submitted to the University Rector within a maximum time of thirty days from the notification date; otherwise, the resolution shall be considered final. If the appeal was delivered before the end of the defined duration, the University Rector shall refer the case once more to the Disciplinary Committee for further investigation, and if the Committee persisted, the case shall be referred once more to the University Council, the resolution of which shall be conclusive.
- 8 The disciplinary sanctions which may be inflicted on the staff member and the like are as follows:
- a) Written censure.
 - b) Reprimand.
 - c) Reduction in salary, provided that forfeiture does not exceed a three-month net salary, nor should the sum deducted each month exceed one third of the monthly salary.
 - d) Denial of one periodical increment.
 - e) Adjournment of promotion for one year.
 - f) Transference from the academic work and assignment to another for a maximum period of five years.

12 Appendix A “Program Study Plan”

1. OVERVIEW

Courses represent the backbone of any academic program; therefore, they should be selected carefully and meeting with standards. For more than 40 years, the Association for Computing Machinery (ACM) and IEEE Computer Society have sponsored curricular guidelines for academic programs in computer science, with new volumes in this series released approximately every decade. Until the moment of designing this study plan, the most recent report was Computer Science Curricula 2013¹, was released in December 2013, and reflects input from well over 100 researchers and practitioners in computing from around the world (ACM/IEEE-CS, 2013). As a part of this curricula is the **Intelligent Systems Knowledge Area** (ISKA)², which includes many of the topics of artificial intelligence.

¹ ACM/IEEE-CS Joint Task Force on Computing Curricula (2013). Computer Science Curricula 2013. ACM Press and IEEE Computer Society Press. DOI: <http://dx.doi.org/10.1145/2534860>.

² <https://dl.acm.org/doi/abs/10.1145/2735392.2735394>

2. Knowledge Areas

The ACM/IEEE curricula showed a list of core sub-areas and elective sub-areas in Intelligent Systems. The core sub-areas put greater emphasis on machine learning and probabilistic reasoning, and less on theorem proving, reflecting the broader trend in both research and application. The elective sub-areas provide a broader inclusion of the myriad topics related to Intelligent Systems.

ACM/IEEE-Core Topics	ACM/IEEE-Elective Topics
Introduction to Intelligent Systems Basic Search Strategies Knowledge Representation and Reasoning Basic Machine Learning	Advanced Search Advanced Representation and Reasoning Reasoning Under Uncertainty Agents Natural Language Processing Advanced Machine Learning Robotics Perception and Computer Vision

Some areas from the above two lists are already covered in the undergraduate level. Accordingly, in the curricula of MSAI program, we consider the following six knowledge areas in intelligent systems plus the foundations of computer science. A list of the elective subareas in Intelligent Systems is included below.

MSAI-Knowledge Areas
1. Machine Learning 2. Intelligent Interaction 3. Perception and Computer Vision 4. Data Analytics and Knowledge Engineering 5. Computational Intelligence and Robotics 6. Applications of Artificial Intelligence

3. Courses Analysis

The program includes a number of courses to ensure that the graduate acquires all related skills and knowledge covers each knowledge area. After deep investigation and an exhaustive survey of the world top ranked universities in addition to the ACM/IEEE curricula recommendations, Table 6 shows the courses that cover each knowledge area.

Table 6: MSAI program- Knowledge Areas and courses

#	Knowledge Area	Course
1	Machine Learning	Machine Learning
		Deep Learning
		Automated Reasoning and Planning
2	Intelligent Interaction	Speech Recognition and Processing for Multimedia
		Natural Language Processing
		Mixed Reality Technologies
3	Perception and Computer Vision	Foundations of Computer Vision
		Pattern Recognition
		Machine Learning for Computer Vision
		Image Analysis and Media Understanding
4	Data Analytics and Knowledge Engineering	Data Processing and Analytics
		Scalable Machine Learning
		Semantic Web and Ontology Engineering
		Knowledge Representation and Reasoning

5	Computational Intelligence and Robotics	Robotics Applications
		Computational Intelligence
		Multi-Agent Systems and Reinforcement Learning
		Principles of Distributed Computing
6	Applications of Artificial Intelligence	Web Intelligence
		Research Trends in AI
		Intelligent Internet of Things
7	Foundations of Computer Science	Foundations of AI
		Programming Techniques in AI
		Research Methodology

4. Core Courses

To demonstrate a breadth of knowledge of the students in the area of AI, core requirements are set in the study plan. This is because the core courses reflect a minimum level of knowledge in the field of study and hence are designed accordingly. A number of core courses are selected to provide the students a solid foundation in the knowledge areas that are central to artificial intelligence. As such, these core courses will serve as basis to the advanced elective courses. The students are advised to complete all the core courses in the first year of their study. The core courses offered in the **MSAI** program are listed in Table 7.

Table 7: MSAI program- Core courses

No.	Course Code	Course Name	Prerequisite
1	-1660	Foundations of Artificial Intelligence (AI)	---
2	-1661	Machine Learning	---

3	-1662	Programming Techniques in AI	---
4	-1663	Research Methodology	Foundations of AI

Table 8: MSAI program- Elective courses and their prerequisites

No.	Course Code	Course Name	Prerequisite
1	0911-1664	Automated Reasoning and Planning	Foundations of AI
2	0911-1665	Deep Learning	Machine Learning
3	0911-1666	Foundations of Computer Vision	Machine Learning
4	0911-1667	Pattern Recognition	Machine Learning
5	0911-1668	Image Analysis and Media Understanding	Foundations of CV
6	0911-1669	Machine Learning for Computer Vision	Foundations of CV
7	0911-1670	Data Processing and Analytics	Machine Learning
8	0911-1671	Scalable Machine Learning	Data Proc. and Analytics
9	0911-1672	Semantic Web and Ontology Engineering	Data Proc. and Analytics
10	0911-1673	Knowledge Representation and Reasoning	Foundations of AI
11	0911-1674	Speech Recognition and Processing for Multimedia	Pattern Recognition
12	0911-1675	Natural Language Processing	Machine Learning
13	0911-1676	Mixed Reality Technologies	Machine Learning for CV
14	0911-1677	Robotics Applications	Foundations of AI
15	0911-1678	Computational Intelligence	Machine Learning
16	0911-1679	Multi-Agent Systems and Reinforcement Learning	Machine Learning
17	0911-1680	Principles of Distributed Computing	Prog. Techniques in AI
18	0911-1681	Web Intelligence	Prog. Techniques in AI
19	0911-1682	Research Trends in AI	Research Methodology
20	0911-1683	Intelligent Internet of Things	Machine Learning

5. Elective Courses

Depending on their backgrounds, the students have the chance to select among various elective courses that cover the whole of knowledge areas of the **MSAI** program. Offering the elective courses will be managed by the department and according to the student's demand. Through a controlled selection mechanism, the student may choose either a theory oriented or applications-oriented courses. Table 8 shows the list of elective courses. Certainly, the academic advisor will help the student to select the elective courses based on the student's wishes and skills. By this way, we ensure that the selected courses' learning outcomes are supported the student to delve deeper in one of the following SEVEN professional paths:

- 1) Machine Intelligence**
- 2) Data analytics and knowledge management**
- 3) Vision-based systems**
- 4) Intelligent interaction**
- 5) Knowledge representation and reasoning**
- 6) Cyber security and intelligent internet of things**
- 7) Robotics and agent-based systems.**

Based on the number of admitted students, it is possible to offering the courses that may serve the above paths. In such case, graduate will get a Master degree in AI with focus in one of the above SEVEN professional paths.

14.5.1 Courses Assessment Policy

Two schemes of assessment are adopted in this program, as shown in Table 9. The first scheme is devoted for theoretical courses and the other scheme is devoted for practical courses.

Table 9: MSAI program- Schemes of courses assessment polices

Assessment By:	Final Exam	Midterm	Quizzes	Capstone Project	Assignments
First Scheme Theoretical Course (TC)	40	20	10	20	10
Second Scheme (Practical Course) (PC)	30	15	---	40	15

14.5.2 Dissertation/Project Course

This course provides the student with an opportunity to undertake extensive investigation in an advanced or specialized topic relating to artificial intelligence trends. In this course, the student has the opportunity to plan and execute a significant project of research, investigation or development. In addition, this course enables the student to communicate with peers, senior colleagues and faculty members through milestones, reports, and dissertation.

This course can be taken in any of two forms either as a dissertation or as a project, to train the students on either research or development or both. The core course on "Professional Practice and Research

Assessment By:	Final Exam	Midterm	Quizzes	Capstone Project	Assignments
First Scheme Theoretical Course (TC)	40	20	10	20	10
Second Scheme (Practical Course) (PC)	30	15	---	40	15

Methodology" will prepare the students for conducting research, seeking solutions, and writing dissertation or reports. The information about dissertation/project along with prerequisites is given in Table 10.

Table 10: MSAI program- Dissertation/Project Courses

Course Code	Course Name	No. of Units	Prerequisites
0911-1684	Project Proposal		Research Methodology
0911-1685	Project Implementation		Project Proposal
0911-1686	Dissertation		Research Methodology

13 Appendix B “Course Descriptions”

The description of each individual course is given along with the learning outcomes of each course. In addition, each course's description shows the assessment policy that should be adopted during the course delivering. Furthermore, the description lists a number of textbooks and references (or resources) that should be used by the instructor and students during the course running. Each course's instructor should adhere with the given information and policy of each course. Slight changes to course description and/or updating the assessment policy and/or the textbook are possible after getting the approval of the program coordinator.

Assessment By:	Final Exam	Midterm	Quizzes	Capstone Project	Assignments
First Scheme Theoretical Course (TC)	40	20	10	20	10
Second Scheme (Practical Course) (PC)	30	15	---	40	15

Course Name	Foundations of Artificial Intelligence		أساسيات الذكاء الاصطناعي			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1660	660	3 (3-0-6)	---		
Course Track	☒ Program Core ☐ Electives					
Course Description. Now-a-days in almost all applications, we expect computers to act and perform like human! How possibly a computer could achieve that? The answer is Artificial Intelligence (AI). This course is designed to introduce the theory and practices of AI and will be strongly method-oriented. The course starts with an overview of AI (motivation, history, approaches, key domains, examples). Then, the course will cover the mathematical foundations that utilized in AI and its related subjects. Namely, it builds upon fundamental concepts in linear algebra, probability theory, multivariate calculus and statistics. Next, it provides full details of the rationality concept, rational agents, agent programs and task environments. It includes how rational agents will deal with uncertain knowledge and reasoning in decisions and acting under uncertainty with focusing on probabilistic reasoning and Bayesian networks topics. The topic of reasoning will be elaborated by covering logical agents, propositional and predicate logic with inferences, satisfiability and model construction, modeling with logic etc. The classical planning problem will be briefly explained. The course also covers how a problem-solving agents solve problems using uninformed search, Heuristic or Informed Search, and Local Search techniques. Moreover, AI game theory will be discussed including Adversarial Search algorithms and Constraint Satisfaction Problems.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe basic concepts and methods related to AI [A] 2. Understand the mathematical concepts behind some of the key methods in artificial intelligence and machine learning. [C] 3. Examine the characteristics of Agent Task Environments and find a suitable agent program based on that [B] 4. Apply and compare different techniques for goal search for a specific AI problem [E] 5. Identify differences between various inference techniques under the reasoning paradigm [A] 6. Analyze a reasoning problem with appropriate techniques and construct a model as a solution [C]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20%
	Midterm Exam	20%	Final Exam	40%		
Textbook	Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 4 th Edition, 2020, ISBN: 0134610997					
References	1. Kevin Warwick, "Artificial Intelligence: The Basics", Routledge; 1 st Edition 2011, ISBN: 0415564832. 2. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, “Mathematics for Machine Learning”, Cambridge University Press, 2020, ISBN-13: 978-1108455145.					

Course Name	Machine Learning		تعلم الآلة			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1661	661	3 (3-0-6)	---		
Course Track	☒ Program Core ☐ Electives					
Course Description. Machine learning (ML) uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can sift through large volumes of data at high speed to make predictions or decisions without human intervention. This course will familiarize students with a broad cross-section of models and algorithms for ML, and prepare students for research or industry application of ML techniques. The course starts with an introductory part includes mathematical basics, statistical learning theory, kernels, and Gaussian processes. Then the course demonstrates different kinds of learning methodologies including inductive, Bayes learning, decision trees, ensemble, linear regression, logistic regression, non-parametric models, Markov models, autoregressive models, support vector machine, artificial neural networks, etc. The appropriateness of these learning models will be discussed for various learning problems such as classification, clustering, regression, that fall under supervised, unsupervised, and reinforcement learning paradigms, as well as new learning paradigms, such as, self-supervised learning. Finally, an applied machine learning project implementation needs to be carried out using ML models with an emphasis to the rigorous application of validation techniques.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe the basic concepts and theories related to the machine learning domain of AI. [B,C] C1 C2 2. Distinguish and use different techniques of machines learning applicable to several problem domains. [D] S1 3. Apply a wide variety of algorithms to simulated and real-world problems, optimize the learning models, and report on the expected accuracy of the models. [A, D] K2 S1 4. Evaluate machine learning algorithms and compare with alternative techniques. [E] S2						
Assessment Policy (TC)	Assignments	10 %	Quiz	10 %	Capstone Project <td rowspan="2">20 %</td>	20 %
	Midterm	20 %	Final Exam	40 %		
Textbook	1. Ethem Alpaydin, "Machine Learning: The New AI", MIT Press 2016. ISBN9780262529518. 2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "Elements of Statistical Learning: Data mining, Inference and Prediction", 2 nd Ed, Springer, 2009, ISBN-978-0387848846.					
References	Aurélien Géron “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" 2 nd Edition, O'Reilly Media, 2019. ISBN978-1492032649					

Course Name	Programming Techniques in AI		أساليب البرمجة في الذكاء الاصطناعي			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1662	662	3 (3-0-6)	---		
Course Track	☒ Program Core ☐ Electives					
Course Description. This course aims to provide appropriate computing background to students who will study other courses in Data Science, Machine Learning and AI. It uses the Python language as the main vehicle but focusses on conceptual material rather than just the language itself. It moves fast through introductory Python workings. It covers several important Python libraries in detail. It discusses approaches to build re-usable, high quality code but not on software engineering. It also visits some extra topics such as version control and programming language for statistics. Student will learn core Python language concepts, work with the key Python libraries for AI and get a strong understanding on how Python is used for the development of AI and data analysis applications. This course cover topics like: installing the essential packages to create an AI and data analysis coding environment, understanding the basic functions, data structures, and syntax of the Python language that are used to handle large datasets with ease, using NumPy, SciPy and pandas libraries for matrix calculations and data manipulation, studying how to use Matplotlib to create highly customizable visualizations. It also introduces the main machine learning libraries like scikit-learn, PyTorch, Tensorflow, and many examples, testing, notebooks, cloud execution. It will utilize up-to-date versions of software.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Understand the core Python concepts as well as the important libraries used in AI and data analysis. [A, E] 2. Demonstrate awareness and a fundamental understanding of various applications of AI algorithms and data analysis techniques. [E] 3. Implement a set of AI algorithms and data analysis techniques using the Python programing language and the related libraries. [D, E] 4. Use the appropriate tools to handle and visualize different forms of data. [E]						
Assessment Policy (PC)	Assignments	15%	Quiz	--	Capstone Project	40 %
	Midterm	15%	Final Exam	30 %		
Textbook	Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Python”, 2 nd Edition, O'Reilly Media, 2017. ISBN-13: 978-1491957660.					
References	1. Alberto Artasanchez and Prateek Joshi, “Artificial Intelligence with Python”, 2nd Edition, Packt Publishing, 2020. ISBN-13: 978-1839219535. 2. Rohan Chopra, Aaron England and Mohamed Alaudeen, “Data Science with Python”, Packt Publishing, 2019. ISBN-13 978-1838552862. 3. Joshua Eckroth, “Python Artificial Intelligence Projects for Beginners”, Packt Publishing, 2018. ISBN-13: 978-1789539462.					

Course Name	Research Methodology		طرق البحث			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1663	663	3 (3-0-6)	Foundation of AI		
Course Track	☒ Program Core		☐ Electives			
Course Description. The objective of this course is two folds. The first objective is to build the capacity of young professionals to investigate, identify, demonstrate and promote AI techniques for industrial applications. This part discusses how to promote cross-fertilizing AI techniques with other scientific fields today applied in industry. Then, the course introduce students to a range of ethical issues and restrictions that arise regarding current and future AI. Also, it discusses the moral framework and value system that assess the impact of AI systems. Topics of this part include, Robot rights, AI existential threats, Biases in learning algorithms, Ethics of AI in warfare, Ethics of AI in self-driving cars, moral harms to AI, AI and future of human jobs. The second part explores, in general, the required skill to conduct advanced research in AI and computer science. This part will guide the students how to plan, conduct and report on empirical investigations. It includes techniques and software for defining the research question and the research plan construction including main AI research domains. Making literature review including finding, evaluating and reviewing research papers. Experimental design including data generation, modeling and validation; algorithms calibration, testing, empirical evaluation and benchmarking; results representation, visualization and interpretation. Research reporting, presenting and publishing along with awareness about plagiarism and main AI periodicals. Ethics considerations and best professional practices for the above points will be developed.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Determine the AI technologies, tools, and algorithms that would be suitable for Industrial applications. [A] 2. Demonstrate an awareness of ethical implications of AI as a technological and social phenomenon. [F] 3. Identify a research topic in AI and justify its worth and study the research approaches, tools, techniques and methodologies used in AI research. [B, E] 4. Develop and apply fundamental research skills including literature reviews, collection and analysis of data and designing a research project in AI. [C, D] 5. Acquire ability to express arguments clearly and concisely [E]						
Assessment Policy (PC)	Assignments	15%	Quiz	--	Capstone Project <td rowspan="2">40 %</td>	40 %
	Midterm	15%	Final Exam	30 %		
Textbook	1. Dignum, Virginia, "Responsible Artificial Intelligence-How to Develop and Use AI in a Responsible Way", Springer 2019. ISBN 9783030303716 2. Paul R. Cohen, "Empirical Methods for Artificial Intelligence" A Bradford Book 2017.					
References	1. Bostrom (2014), "Superintelligence: Paths, Dangers, Strategies," Oxford Univ Press. 2. Lin, P. (Ed.), (2017), "Robot Ethics 2.0", Oxford University Press.					

Course Name	Automated Reasoning and *Planning		الاستدلال والتخطيط الآلي			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1664	664	3 (3-0-6)	Foundations of AI		
Course Track	☐ Program Core		☒ Electives			
Course Description. In many applications, we expect computers to reason logically and generate a set of logical actions. We might naively expect this to be what computers are good at, but in fact they find these extremely difficult. This course looks at various methods to automate logical reasoning and planning procedure, which are needed to support a variety of application domains. Automated reasoning procedures are parametrized by the logic they are capable of reasoning with. The course distinguishes between propositional logic and first-order logic inferences. Development and application of propositional logic procedures will be described in details, e.g., solving constraint satisfaction problems, applications in hardware design, verification, and planning and scheduling. The course discusses applications, standard deductive procedures such as resolution, and basic concepts, such as unification. This course will also investigate the aspect of automated reasoning that overlaps with automated planning. Examples of combining the automated reasoning techniques with planning methods will be presented referring to recent research trends, which includes planning as satisfiability using propositional logic, planning as non-monotonic logic, and Flexible planning as fuzzy description logic. The theory and algorithms we will be exploring in this course are applicable to a diversity of problems beyond the development of intelligent agents or cognitive robots, including software and hardware verification, program synthesis, activity recognition, plan understanding, and automated monitoring and diagnosis. The course project explores an application of reasoning based planning.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe the basic principles of reasoning via propositional and first-order logic [A] 2. Identify differences between propositional vs. first-order inference systems [A] 3. Analyze and solve first-order logic instances using standard deduction procedures [A] 4. Combine planning methods as satisfiability with appropriate reasoning techniques [E] 5. Relate and adapt the application of reasoning based planning to various problem domains [E]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20%
	Midterm	20%	Final	40%		
Textbook	1. Alan Robinson, Andrei Voronkov, “Handbook of Automated Reasoning (Volume 1)”, North Holland, 1 st Edition, 2001. ISBN-13: 978- 0444508133. 2. Malik Ghallab, Dana Nau, Paolo Traverso, “Automated Planning: Theory and Practice”, Elsevier, 1 st Edition, 2004. ISBN-13: 978- 1558608566.					
References	James Allen; Henry Kautz; Richard Pelavin; Josh Tenenber, “Reasoning about plans”, Publisher- Morgan Kaufmann, 1992. ISBN-13: 978-1558601376.					

Course Name	Deep Learning		التعلم العميق			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1665	665	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core		☒ Electives			
Course Description. Deep learning is a branch of machine learning concerned with the development and application of advanced neural networks. Deep learning algorithms extract high-level representations of data in a layered architecture in such a way that maximizes performance on a given task. The goal of this course is to provide students a comprehensive understanding of the concepts of <u>advanced artificial neural networks</u> and their <u>applications</u> in several domains. The course starts with a recap of <u>linear models</u> and discussion of <u>stochastic optimization</u> methods that are crucial for the learning of deep neural networks. Then, the course covers a range of all popular building blocks of deep learning methodologies including <u>standard and deep neural networks</u>, <u>fully connected networks</u>, <u>convolutional and recurrent network structures</u>, <u>generative adversarial networks</u>, <u>deep unsupervised and reinforcement learning</u>. The course demonstrates the application of these models into real world problems in several domains including <u>speech recognition</u>, <u>computer vision</u>, and <u>natural language understanding</u>, and so on. Throughout the course, the student will have the opportunity to develop a project using the recent deep learning frameworks in Python such as Keras, TensorFlow, etc.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Understand the basic concepts <u>of linear models and stochastic optimization methods</u>. [A, C] 2. Distinguish and develop different <u>building blocks of advanced deep neural networks</u> in various domains. [B] 3. Evaluate <u>deep learning models performance</u> and interpret the results and compare their performance with alternative models. [E] 4. Understand <u>the functioning and limitations of different deep learning models</u> for a given setting. [F] 5. Apply deep learning algorithms to a specific practical and real world problem. [D]						
Assessment Policy (PC)	Assignments	15%	Quiz	--	Capstone Project	40%
	Midterm	15%	Final Exam	30 %		
Textbook	Ian Goodfellow, Yoshua Bengio, Aaron Courville “Deep Learning”, MIT Press, 2016. ISBN-13: 978-0262035613.					
References	1- Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018, ISBN 9781617294433. 2- Aurélien Géron. "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems" O'Reilly Media, 2nd Edition, 2019. ISBN 9781492032649					

Course Name	Foundations of Computer Vision		أساسيات الرؤية بالحاسب			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1666	666	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core ☒ Electives					
Course Description Vision is one of our senses that allow us to build a powerful internal representation of the world. The goal of computer vision is to "discover from images what is present in the world, where things are located, what actions are taking place" (Marr 1982). To achieve this goal, we need to know how light is reflected off surfaces, how objects move, and how this information is projected onto an image. This course is an introduction to basic concepts in computer vision and research topics. Topics to be covered will be: image sensing and formation, edge detection, feature detection and image segmentation, image transformations (e.g., warping, morphing, and mosaics) for image synthesis, methods for reconstructing three-dimensional scene information using techniques such as depth from stereo, structure from motion, shape from shading, focus and motion. Video analysis and object recognition will also be discussed.						
Course Outcomes After the completion of this course, the student will be able to: 1. Describe the main concepts of image processing and computer vision. [A] 2. Formulate real world problems using computer vision algorithms. [E] 3. Understanding mathematical models related to computer vision algorithms. [C] 4. Describe and analyze several feature extraction techniques. [A, E] 5. Reconstruct shape from stereo, motion or shading and recognize objects. [D, E]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	1. E. R. Davies, “Computer Vision: Principles, Algorithms, Applications, Learning”, 5 th Edition, Academic Press, 2017, ISBN-13: 978-0128092842. 2. Computer Vision: Algorithms and Applications by Richard Szeliski, 1 st Edition, Springer, 2010. ISBN: 1848829345.					
References	1. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, 1 st Edition, Cambridge University Press, 2012, ISBN-13: 978-1107011793. 2. Alberto Fernandez Villan, “Mastering OpenCV 4 with Python: A practical guide covering topics from image processing, augmented reality to deep learning with OpenCV 4 and Python 3.7”, Packt Publishing, 2019. ISBN-13: 978-1789344912.					

Course Name	Pattern Recognition		التعرف على الأنماط			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1667	667	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core ☒ Electives					
Course Description This course introduces students to the foundations of pattern recognition algorithms and techniques. Challenges include constructing probabilistic and pattern-based representations of data domains in addition to making inferences about pattern identities and classes. Topics covered in this course include: statistical and structural methods; data structures for pattern representation; feature discovery and selection; classification vs. description; parametric and nonparametric classification; supervised and unsupervised learning; use of contextual evidence; clustering; recognition with strings; and small sample-size problems.						
Course Outcomes After the completion of this course, the student will be able to: 1. Describe pattern recognition theories, such as Bayes classifier, linear discriminant analysis and Hypothesis testing. [A] 2. Identify modern methods for recognition of patterns in varied applications such as digital images, human speech and sound, strings and sequences. [B] 3. Construct appropriate feature representations for a given recognition problem. [C] 4. Use different approaches like: statistical techniques, heuristic search, Markov models, template matching, grammatical inference and neural networks for pattern recognition problems. [D] 5. Apply pattern recognition techniques in practical problems. [E]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	40 %
	Midterm	15%	Final	30%		
Textbook	Sergios Theodoridis and Konstantinos Koutroumbas, "Pattern Recognition & Matlab Intro: Pattern Recognition," 4 th Edition, Academic Press, 2008. ISBN: 1597492728.					
References	Christopher M. Bishop "Pattern Recognition and Machine Learning", Springer, 2007. ISBN: 0387310738.					

Course Name	Image Analysis and Media Understanding		تحليل الصور الرقمية وفهم الوسائط المتعددة			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1668	668	3 (3-0-6)	Foundations of CV		
Course Track	☐ Program Core		☒ Electives			
Course Description. This course introduces algorithms in image processing, analysis and scene understanding to develop students with basic knowledge to explain how computer could analyze and understand the visual world. The course describes visual understanding from the perspective of low-level image processing, mid-level statistical inferencing, and high-level vision recognition. It will cover a wide range of topics that include morphological process, image enhancement, feature extraction, image segmentation, semantic segmentation, image and video compression, object recognition, action recognition, motion analysis and scene understanding. Several image/video processing and analysis tools and libraries will be utilized to build real-world applications.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Explain the basic concepts associated with images/video processing, analysis, enhancement, segmentation and compression. [E] 2. Demonstrate knowledge of image analysis and understanding algorithms and applications. [A] 3. Design and implement appropriate image\video analysis algorithms, techniques, and tools that help to solve visual understanding problems. [C, D] 4. Evaluate the performance of image analysis and understanding algorithms and systems. [B]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	40 %
	Midterm	15%	Final	30%		
Textbook	1. Milan Sonka, Vaclav Hlavac, and Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 4 th Edition, Cengage Learning, 2014, ISBN-13: 978-1133593607. 2. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, 4 th Edition, Pearson, 2017, ISBN-13: 978-0133356724.					
References	1. Mark Nixon, and Alberto Aguado, “Feature Extraction and Image Processing for Computer Vision”, Academic Press, ISBN-13: 978-0128149768. 2. Michael Ying Yang, Bodo Rosenhahn, Vittorio Murino, “Multimodal Scene Understanding”, 1 st Edition, Academic Press, 2019, ISBN-13: 978-0128173589. 3. Rama Chellappa, Sergios Theodoridis, “Image and Video Processing and Analysis and Computer Vision”, 1 st Edition, Academic Press, 2017, ISBN-13: 978-0128118894.					

Course Name	Machine Learning for Computer Vision		التعلم الآلي لنظم الرؤية بالحاسب			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1669	669	3 (3-0-6)	Foundations of CV		
Course Track	☐ Program Core		☒ Electives			
Course Description. Computer Vision has become ubiquitous in our society, with applications in search, image understanding, apps, mapping, medicine, drones, and self-driving cars. Core to many of these applications are visual recognition, which is the process of automatically extracting valuable information from visual data (images and videos). This includes knowing what objects are in a picture, where they are, what's happening, and where it is happening. Given the nature of the problem and the abundance of data available today, visual recognition is typically formulated as a machine learning problem. In this course students study the problems of instance-level object recognition, category-level object recognition, action recognition, pose estimation, detection, and segmentation. The course will cover a wide range of supervised, semi-supervised, and unsupervised models (consisting of fully-, partially-, and un-labeled data), as well as transferable models in object and activity recognition (learning from one dataset or task and applying to a different one). The state-of-the-art models and algorithms related to these tasks will also be discussed and implemented.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe and compare different visual recognition tasks. [A] 2. Formulate visual recognition tasks as machine learning problems and identifying appropriate solutions. [C] 3. Apply the state-of-the-art machine learning algorithms to solve visual recognition problems. [D] 4. Analyze and evaluate machine learning models intended to accomplish visual recognition tasks. [B, E]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	40 %
	Midterm	15%	Final	30%		
Textbook	1. E. R. Davies, “Computer Vision: Principles, Algorithms, Applications, Learning”, 5 th Edition, Academic Press, 2017, ISBN-13: 978-0128092842. 2. M. Arif Wani, Farooq Bhat, Saduf Afzal, Asif, “Advances in Deep Learning (Studies in Big Data)”, Springer, 2020. ISBN-13: 978-9811367960.					
References	1. Xiaoyue Jiang, Abdenour Hadid, Yanwei Pang, Eric Granger, Xiaoyi Feng, “Deep Learning in Object Detection and Recognition”, 1 st Edition, Springer, 2019. ISBN-13: 978-9811051517. 2. Ivan Vasilev, “Python Deep Learning: Exploring deep learning techniques and neural network architectures with PyTorch, Keras, and TensorFlow”, 2 nd Edition, Packt Publishing, 2019. ISBN-13: 978-1789348460.					

Course Name	Data Processing and Analytics		معالجة وتحليل البيانات			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1670	670	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core		☒ Electives			
Course Description						
This course introduces the basic concept and architecture of data, data analytics taxonomy and methodologies. It covers several techniques for descriptive analysis and data visualization including descriptive univariate, bivariate and multivariate analysis methods. It also presents the advanced techniques for data preprocessing, data transformation and dimensionality reduction. It introduces various clustering, classification, data summarization and frequent pattern mining methods. Predictive analytics methodologies (including search-based algorithms and optimization-based algorithms) and advanced predictive topics such as ensemble learning, algorithm bias, non-binary classification tasks and advanced data preparation techniques for prediction are introduced. Finally, it presents some of popular data analysis applications for text, web and social media.						
Course Outcomes						
After the completion of this course, the student will be able to:						
1. Describe general data architecture and data analytics methodologies. [A]						
2. Model and visualize data using descriptive analysis methods. [C]						
3. Apply data preprocessing techniques and dimensionality reduction methods to big data. [E]						
4. Explain and apply various clustering and classification techniques on large scale data. [D]						
5. Identify the advanced methodologies of predictive analytics. [A]						
6. Discuss and apply different descriptive and predictive analytics techniques on text, web and social media. [E]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	João Moreira, Andre Carvalho, Tomás Horvath, “A General Introduction to Data Analytics”, John Wiley & Sons Inc., 2019. ISBN: 9781119296256.					
References	1. Bertrand S. Clarke, Jennifer L. Clarke, “Predictive Statistics Analysis and Inference Beyond Models”, Cambridge University Press, 2018. ISBN: 9781107028289 2. Bruce Ratner, “Statistical and Machine-Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data”, 3 rd Edition, Taylor & Francis Group/CRC Press, 2017, ISBN: 9781498797603 3. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, 2 nd Edition, O'Reilly Media, 2017. ISBN-13: 978-1491957660.					

Course Name	Scalable Machine Learning		التعلم الآلي القابل للتضخم			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1672	672	3 (3-0-6)	Data Processing and Analytics		
Course Track	☐ Program Core		☒ Electives			
Course Description						
Most real-world machine learning work involves very large data sets that go beyond the CPU, memory and storage limitations of a single computer. Crafting an enterprise-scale cost-efficient machine learning solution for Big data to uncover insights and value from an organization's data or to incorporate data-driven decisions into their process is a challenge. In this course, students will learn the machine learning techniques to explore, analyze, and leverage data, and they will be introduced to tools and algorithms that can be used to create machine learning models, and to scale those models up to big data problems. The key objective is how to use these technologies in manipulating, storing, analyzing and visualizing big data to create intelligent solutions in social networks, health, telecommunication, finance and many other fields. Major topics may include noise handling, feature extraction, selection, and learning algorithms in developing such systems; machine learning techniques in big data analytics; processing structured, unstructured and semi-structured data; open source tools like KNIME and Spark with examples that guide through the basic analysis of Big Data; data mining with NoSQL, cloud databases, and enterprise data analytical solutions among other cutting edge big data applications using emerging technologies. The student will gain hands-on experience through a guided project on how to build a data analytics solution using different tools and methods learned during the course.						
Course Outcomes. After the completion of this course, the student will be able to:						
1. Describe the basic principles of machine learning and big data. [A]						
2. Develop a data strategy and process for how data will be generated, collected, and consumed. [C]						
3. Identify, apply and evaluate appropriate technology and machine learning techniques to process structured and unstructured data to solve sample business case [D, E]						
4. Apply appropriate machine learning techniques for Big data analytics in practical applications. [E, F]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	1. Nataraj Dasgupta, “Practical Big Data Analytics: Hands-on techniques to implement enterprise analytics and machine learning using Hadoop, Spark, NoSQL and R”, Packet Publishing, 2018, ISBN:9781783554393. 2. Md. Rezaul Karim, Md. Mahedi Kaysar, Large Scale Machine Learning with Spark, Packt Publishing, 2016, ISBN-13: 978-1785888748.					
References	EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Willy, 2015, ISBN: 9781118876138.					

Course Name	Semantic Web and Ontology Engineering		الهندسة الدلالية وشبكات المعاني			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1672	672	3 (3-0-6)	Data Processing and Analytics		
Course Track	☐ Program Core ☒ Electives					
Course Description. The current web has experienced massive amount of data in different formats (i.e. text, speech, images, video, maps) that are difficult for machines to understand. World Wide Web Consortium (W3C) is the main international standards organization for the World Wide Web that promotes for machine-understandable data targeting better web version called “Semantic Web” (or Web 3.0). The Semantic Web is an advanced development of the World Wide Web wherein the meaning (semantics) of data distributed over the Web. This course begins with an introduction about the Semantic Web technology in terms of the theory, practice, and architecture. Then, it includes Semantic Web languages, Resource Description Framework (RDF), Web of data, semantic annotation, and storage and querying. Next, the topics of Web ontology language, rule interchange format, and reasoning on the Web. Ontology development and evolution, and its applications are covered as well. Students will be introduced to many leading edge solutions for the semantic web tools including semantic crawlers, ontology editors, annotation tools linked open data, knowledge graphs, etc. Applications may include validation of Semantic Web technologies in real life case studies, in particular, Dr. Watson, Yahoo! Search Monkey, ACTIVE case study, INSEMTIVES case studies, and LARKC case study.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe the theory and overall architecture of the semantic web technologies. [A] 2. Understand ontology engineering methodologies and ontology engineering tools. [C] 3. Model and design ontologies using web ontology language. [B] 4. Implement semantic-web based applications using different web tools in a diversity of case studies. [D, E] 5. Analyze the limitations of the semantic web technologies and ethical concerns. [F]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	Antoniou, Grigoris, Paul Groth, Frank van Harmelen, and Rinke Hoekstra. “Semantic Web Primer”, 3 rd Edition. MIT Press, Cambridge, MA, 2012. ISBN 978-0-262-01828-9.					
References	1. Péter Szeredi, Gergely Lukácsy, Tamás Benkő, “The Semantic Web Explained — the technology and mathematics behind Web 3.0”, Cambridge University Press (2014), ISBN: 9780521700368 2. Pascal Hitzler, Aldo Gangemi, Krzysztof Janowicz, Adila Krishnadi, Valentina Presutti, “Ontology Engineering with Ontology Design Patterns: Foundations and Applications”, IOS Press (2016), ISBN: 9781614996750					

Course Name	Knowledge Representation and Reasoning		التمثيل والاستدلال في المعرفة			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1673	673	3 (3-0-6)	Foundations of AI		
Course Track	☐ Program Core ☒ Electives					
Course Description. Knowledge Representation and Reasoning (KRR) is branch of AI that explores formalisms to represent knowledge about the world on computer systems and what kinds of reasoning can be done about the represented knowledge. Such formalisms include findings from logic, semantics and ontologies will allow automated reasoning and making decisions easier and more accurate in complex systems and environments. Challenges of KRR include representation of commonsense knowledge and the ability to represent and manipulate uncertain knowledge and information. The course starts with overview to knowledge-based technologies and knowledge representation, propositional logic as a representation language and as a reasoning technique. Then, the course discusses both representing knowledge and reasoning in first order predicate logic. It covers existing representational formalisms developed within AI, their key concepts and their related inference and reasoning methods. Probabilistic models for reasoning and decision making such as Bayesian networks and Markov processes will be covered, as well. Other kinds of logics such as description logic, and lightweight description logics, either as a knowledge representation language or as a reasoning technique are covered. These concepts will be employed in several applications including rule-based knowledge representation and reasoning, semantic web, and knowledge-based ontologies.						
Course Outcomes. After the completion of this course, the student will be able to: 1.Describe the syntax and semantics of propositional and predicate logic and apply resolution in predicate logic [C] 2.Represent knowledge in description logics and frames and understand their relationship to predicate logic 3.Use planning techniques to determine best sequence actions to achieve specific goals in reasoning problems. [E] 4.Use ontologies to semantically model textual knowledge representations such as in the web. [E] 5.Model knowledge with uncertainty using probabilistic models. [B] 6.Apply basic probability to compute inference and make decisions in probabilistic Knowledge models. [D]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	40 %
	Midterm	20%	Final	40%		
Textbook	Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 4 th Edition, 2020, ISBN: 0134610997.					
References	Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004, ISBN-13: 978-1-55860-932-7.					

Course Name	Speech Recognition and Processing for Multimedia		التعرف على الكلام ومعالجته للوسائط المتعددة			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1674	674	3 (3-0-6)	Pattern Recognition		
Course Track	☐ Program Core ☒ Elective					
Course Description. The main purpose of this course is to provide a comprehensive and clear coverage of Speech Production, Acoustic Models of Speech & Short-time Time Domain Processing, Time Domain Processing, Linear Prediction, Short-time Fourier Transform & Applications, Homomorphic Signal Processing & Cepstral Analysis. This course focuses on Auditory Models, Robustness & Speech Enhancement, Automatic Speech Recognition (ASR). The course will enable the students to get acquisition with Classic HMM/GMM systems, Contemporary Neural Network systems, incl. end-to-end systems, Speech Coding, VAD, Speaker Recognition, Speaker Diarization, Emotion Recognition, Language Models, Conversational Systems, Speech Synthesis.						
Course Outcomes. After the completion of this course, the student will be able to:						
1. Explain the fundamentals of audio and speech signal processing and associated techniques. [A]						
2. Implement practical problems with some basic audio and speech signal processing techniques. [E]						
3. Describe and implement methods and systems for efficient quantization and coding of speech signals and solve given problems regarding these methods. [A, E]						
4. Describe and implement methods for speech enhancement and solve given problems regarding these methods. [A, E]						
5. Describe and implement pattern-recognition applications of speech processing, such as speaker and speech recognition, and evaluate these methods. [A, D]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	20 %
	Midterm	15%	Final	30%		
Textbook	1. Rabiner and Schafer, "Theory and Applications of Digital Speech Processing", Prentice Hall, 2010. 2. Huang, Acero, and Hon, "Spoken Language Processing", Prentice Hall, 2001.					
References	1. Rabiner and Juang, "Fundamentals of Speech Recognition", Prentice Hall, 1993. 2. Deller, Hansen, and Proakis, "Discrete-time Processing of Speech Signals", 2000. 3. Soumya Sen, Anjan Dutta, Nilanjan Dey, "Audio Processing and Speech Recognition: Concepts, Techniques and Research Overviews", Springer; 1 st edition, 2019, ISBN-13: 978-9811360978					

Course Name		Mixed Reality Technologies		تقنيات الواقع المختلط	
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)	
	0911-1676	676	3 (3-0-6)	Machine Learning for CV	
Course Track	☐ Program Core ☒ Electives				
Course Description. Mixed Reality (MR) is the use of both Virtual Reality (VR) and Augmented Reality (AR) technologies to create an environment where physical and virtual objects can exist and interact in real-time. In this course, basics of Virtual Reality (VR), Augmented Reality (AR), Mixed reality (MR) and Mobile VR technologies in human language. The primary focus of the course is on understanding various NLP tasks and related algorithms for effectively solving such inherently complex tasks of processing language. The course includes techniques like materials and texturing that give realistic appearance to the objects will be discussed. Audio main elements such as Words, Speech, Syntax, and Semantics and pragmatics. These main elements includes techniques will also be covered to experience sound great as well as looking great. Interface design principles will be reviewed from human factors and technological perspectives. Hardware, software, and design aspects of virtual interfaces will be investigated. Pitfalls and performance issues to make sure the environment runs fast enough in extensions and experimentation of existing tools and techniques as part of the course projects and assignments. VR will be discussed. Professional game and VR/AR engine, Unity3D will be introduced. The course will culminate in a project in which you will create your own VR/AR or mixed reality experience. This course will also teach VR interaction, how to move around in VR and how to interact with the objects in real world. The Learning approaches to NLP as well as models and techniques related to Machine Translation, Information Extraction, Question Answering and Summarization, Dialogue and Conversational Agents applications in the fields of medicine, education, design and entertainment will be discussed. Hands-on experience will be provided.					
Course Outcomes. After the completion of this course, the student will be able to:					
1. Identify the fundamentals of VR, AR, MR, hardware and software requirements. [A]					
2. Describe the basics of 3D graphics, creation of objects and laying them out to create an environment [C]					
3. Analyze and Evaluate the efficiency and performance of various algorithms and models. [E]					
4. Apply appropriate NLP and machine learning techniques in practical applications. [E, F]					
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project
	Midterm	15%	Final	30%	40 %
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project
	Midterm	15%	Final	30%	40 %
Textbook	1. Vasanth Mohan, Steve Lukas and Erin Pangilinan, “Creating Augmented and Virtual Reality”, Packt Publishing, 2017. ISBN-13: 978-1-787286436				
	2. Jacob Eisenstein, "Introduction to Natural Language Processing", MIT Press, 2019. ISBN-10: 0262042843				
	2. Samuel Greengard, “Virtual Reality”, MIT Press, 2019. ISBN-10: 0262537524				
References	1. Jonathan Linowes and K. Babilinski, “Augmented Reality for Developers: Build practical augmented reality applications”, Packt Publishing, 2017. ISBN-13: 978-1787286436				
	2. Ange Anderson, “Virtual Reality, Augmented Reality and Artificial Intelligence in Special Education”, Routledge; 1 st Edition (March 19, 2019). ISBN-10: 0367145324.				

Course Name	Robotics Applications		تطبيقات علم الروبوتات			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1677	677	3 (3-0-6)	Foundations of AI		
Course Track	☐ Program Core		☒ Electives			
Course Description. Robotics as an application draws from many different fields and allows automation of products as diverse as cars, vacuum cleaners, and factories. Robot design requires integrating a mechanical structure, one or several actuators, one or several sensors, and a controller governing the robot behavior. This controller has also to be implemented by using the dedicated IT tools. The goal of this course is to provide a global vision of robotics challenges to Master students, both in classical applications (industrial robotics) and in more avant-gardist applications. Topics include simulation, coordinate frames, homogeneous transformations, kinematics, control, optimization, and probabilistic inference. In addition, the course contains practical approaches such as manipulator dynamics, Jacobians- velocities and static forces, trajectory planning, Actuators, Sensors, Vision, Fuzzy logic control of manipulator and robotic programming. The mathematical basis of each area is emphasized, and concepts are motivated using common robotics applications and programming exercises. Students will participate in a series of projects over the course of the semester, in which they will implement algorithms that apply each of the topics discussed in class to real robotics problems. Using a hands-on approach, the students in this course will design and fabricate robot prototypes in a group-based term project using controller programs and standard microcontrollers.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe the concepts and theories related to the domain of AI and machine learning for robotic vision [A] 2. Select appropriate sensors for performing robotic tasks [B] 3. Relate and adapt forward and inverse kinematics problems [C] 4. Identify primitive objects employing robotic vision and machine learning techniques [D] 5. Analyze the methods for manipulator kinematics and operate with the resulting equations [C] 6. Understand the ethical concerns in developing robotics-based solutions. [F]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	40 %
	Midterm	15%	Final	30%		
Textbook	Saeed B. Niku, “Introduction to Robotics: Analysis, Control, Applications”, 2nd Edition, Wiley Publisher, 2011, 9780470604465.					
References	- S.K Shaha, “Introduction to Robotics”, 2nd Edition, McGraw-Hill Publisher, 2014. ISBN-9332902801 - John J. Craig, “Introduction to Robotics: Mechanics and Control”, 4th Edition, Pearson, 2017. ISBN-13: 9780133489798.					

Course Name	Computational Intelligence		الذكاء الحسابي			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1678	678	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core		☒ Electives			
Course Description The course objective is to introduce basic principles of various computational methods of data processing in the emerging field of Computational Intelligence (CI). This course focuses on the three fundamental areas of CI which are neural network, fuzzy logic and evolutionary computing. It enumerates principles and techniques needed to formulate solutions to complex problems where traditional approaches are not feasible or effective in the field of pattern recognition, control, automated decision making, optimization, and statistical modeling. It introduces artificial neural networks, supervised, unsupervised and reinforced learning, fuzzy sets and systems, genetic algorithms, and swarm optimization. The student will apply these techniques to solve some real case studies.						
Course Outcomes After the completion of this course, the student will be able to: 1. Describe scope of CI and type of problems to be solved by CI methods [A] 2. Assess strengths and limitations of computation intelligence approaches [A] 3. Formulate a solution and argue its effectiveness solving computational intelligence problem [C] 4. Design and implement CI algorithms to solve real-world problems [D] 5. Review and present scientific research papers in the areas of computation intelligence [E]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	Andries P. Engelbrecht, “Computational Intelligence: An Introduction”, 2 nd Edition, Wiley, 2007. ISBN-13: 978-0-470-03561-0.					
References	1. Keller, James M. Liu, Derong, Fogel, David B., “Fundamentals of Computational Intelligence: Neural Networks, Fuzzy Systems, and Evolutionary Computation”, 2 nd Edition, Wiley-IEEE Press, 2016. ISBN-13: 978-1119214342. 2. Russell C. Eberhart, Yuhui Shi, “Computational Intelligence: Concepts to Implementations”, 1 st Edition, Morgan Kaufmann, 2007. ISBN-13: 978-1558607590.					

Course Name	Multi-Agent Systems and Reinforcement Learning			الأنظمة متعددة الوكلاء والتعلم المعزز		
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1679	679	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core ☒ Electives					
Course Description. The topic of Agents and Multi-Agent Systems examines environment that involve autonomous decision-making software actors to interact with their surroundings with the aim of achieving some individual or overall goal. More recently, significant global attention has focused on the vision of autonomous vehicles, which also follows the core principle of an agent attempting to achieve a set of defined goals. This course will cover several topics related to intelligent agents and multi-agent systems like; the design of intelligent agents - reasoning agents, agents as reactive systems, hybrid agents, layered agents, multi-agent interactions - cooperative versus non-cooperative, zero-sum and other interactions, how cooperation occurs - the Prisoner's dilemma and Axelrod's experiments, interactions between self-interested agents: auctions & voting systems: negotiation, interactions between benevolent agents: cooperative distributed problem solving (CDPS), partial global planning, coherence and coordination in addition to a range of Game Theoretic Models. It will also examine Adaptive Learning Agents using Reinforcement Learning algorithms. It takes a hands-on, practical approach to reinforcement learning theory, beginning with Markov Decision Processes, detailing practical learning examples in discrete environments and how to formulate a reinforcement learning task. It then extends this to continuous problem spaces, detailing Deep Reinforcement Learning with a practical implementation of a Deep Q Network.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Explain and discuss the principles underlying intelligent agents and multi-agent systems. [A] 2. Explain the role of game theory and games in agent design. [A, B] 3. Apply the principle of agents to a range of simulation problems. [C] 4. Understand the theory unpinning reinforcement learning. [A] 5. Apply reinforcement learning to a real-world problem end evaluate its performance. [D, E]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	40 %
	Midterm	15%	Final	30%		
Textbook	H. M. Schwartz, “Multi-Agent Machine Learning: A Reinforcement Approach”, 1 st Edition, Wiley, 2014, ISBN-13: 978-1118362082.					
References	1. Maxim Lapan, “Deep Reinforcement Learning Hands-On: Apply modern RL methods, with deep Q-networks, value iteration, policy gradients, TRPO, AlphaGo Zero and more”, Packt Publishing, 2018. ISBN-13: 978-1788834247. 2. Gerhard Weiss, “Multiagent Systems (Intelligent Robotics and Autonomous Agents series)”, MIT Press, 2013, ISBN 978-0-262-01889-0.					

Course Name	Principles of Distributed Computing		مبادئ الحسابات الموزعة			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1680	680	3 (3-0-6)	Programming Techniques in AI		
Course Track	☐ Program Core ☒ Electives					
Course Description. This course teaches very large scale distributed systems consisting millions of heterogeneous computing systems. Topics include brief introduction, design goals and types of distributed systems, distributed systems architectures, architectures styles and middleware organization, processes, threads, virtualization, cloud computing, client servers, code migration, communications, remote procedure calls and message oriented communication, naming, identifiers, addresses, flat naming, structured naming, and attribute-based naming, coordination, clock synchronization, logical clocks, mutual exclusion, election algorithms and Gossip-based coordination, consistency models, data-centric and client-centric consistency models, replication management, consistency protocols, case study for caching and replication on the Web, fault tolerance, reliable client server communication, reliable group communication, parallel and distributed deep learning using big data with case study and tools, Future of Computation for Machine Learning and Data Science. The course will refer to machine learning/deep learning applications wherever possible.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe challenges and characteristics of distributed systems [C] 2. Explain building distributed systems, algorithms, protocols and recent advancements [E] 3. Explain design issues and performance of distributed systems [C] 4. Evaluate effectiveness and shortcoming of the current solutions of distrusted systems [E] 5. Analyze how the principles are applied in modern distributed systems [A].						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	Maarten van Steen, Andrew S. Tanenbaum, “Distributed Systems”, 3 rd Edition, Published by Maarten van Steen, 2018. ISBN: 978-15-430573-8-6					
References	1. George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, “Distributed Systems: Concepts and Design”, 5 th Edition, 2011, Addison Wesley, ISBN 10: 0-13-214301-1,. 2. Verbraeken, J., Wolting, M., Katzy, J., Kloppenburg, J., Verbelen, T., & Rellermeyer, J.S. (2019). A Survey on Distributed Machine Learning. ArXiv, abs/1912.09789. 3. ACM Symposium on Principles of Distributed Computing, https://www.podc.org/ (Retrieved on 17 Feb 2020) 4. Matthew Stewart, The Future of Computation for Machine Learning and Data Science,					

Course Name	Web Intelligence		ذكاء الويب			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1681	681	3 (3-0-6)	Programing Techniques in AI		
Course Track	☐ Program Core		☒ Electives			
Course Description. This course introduces the basic roles as well as practical impacts of artificial intelligence and advanced information technology for the next generation of web-based systems, services, and environments. It covers Web mining methodologies (web usage mining, web structure mining, and web content mining), semantic web architecture, tools and ontology constructs such as resource description framework (RDF), web ontology language (OWL), and extensible markup language (XML). It also presents a generic architecture on the top of the semantic web for knowledge management and presents the application of semantic web technologies to the social web that forms a network of interlinked and semantically enabled content and knowledge. Different AI and machine learning methods concerning web security, privacy, and reliability issues of cyberspace are covered. Several topics related to human web interaction are also introduced such as interactive information search/retrieval, interactive query expansion, personalization, user profiling, visualization, user interfaces, usability, web adaptation and interactive authoring/annotation. Finally, it presents issues related to agent-based web such as agent typology, intelligent agents, agents for the Web and web services.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Describe the perspectives, characteristics and challenges of Web Intelligence. [A] 2. Explain the architectures of web crawling and Identify web information retrieval models. [A] 3. Apply different web mining methodologies. [D] 4. Analyze semantic web architectures and applications. [B] 5. Understand the different types of topology agents and the architecture of agent-based web. [A] 6. Discuss Web vulnerabilities, human web interaction styles, models and learn how to design an interaction. [E]						
Assessment Policy (PC)	Assignments	15%	Quiz	---	Capstone Project	40 %
	Midterm	15%	Final	30%		
Textbook	Priti Srinivas Sajja, Rajendra Akerkar, “Intelligent Technologies for Web Applications”, Taylor & Francis Group/CRC Press, 2012. ISBN-13: 978-1-4398-7164-5.					
References	1. Pablo E. Román, Juan D. Velásquez, “Advanced Techniques in Web Intelligence-2”, Springer, 2013. ISBN: 978-3-642-33325-5. 2. Douglas McIlwraith, Haralambos Marmanis, Dmitry Babenko “Algorithms of the Intelligent Web”, 2nd Edition, Manning Publications Co., 2016. ISBN: 9781617292583.					

Course Name	Research Trends in Artificial Intelligent		اتجاهات بحثية في الذكاء الاصطناعي	
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)
	0911-1682	682	3 (3-0-6)	Research Methodology
Course Track	☐ Program Core ☒ Electives			
Course Description. AI is moving at an incredible pace along with a rapid innovations either in hardware and software. This course aims to enrich the student experience by handling the latest progress in state-of-the-art AI research and applications. The course contents covers a broad array of research topics and recent trends in systems design to better support the next generation of AI applications, and applications of AI to optimize the architecture and the performance of systems. The course may focus on the applications that cope with Kingdom of Saudi Vision and King Faisal University identity. Accordingly, the course syllabus will continuously be updated with new trends from state-of-the-art research and cutting-edge technology. The format of this course will be a mix of lectures, seminar-style discussions, guest lectures, and student presentations. Guest lectures will be delivered by notable researchers of AI either from the program or outside. Students will be responsible for paper readings, and completing a hands-on project. Readings will be selected from international journals and recent conference proceedings. Suggested project ideas will be provided by the instructor, but students are strongly encouraged to come up with their own project ideas. On completion of this course students should have a broad understanding of some key papers and concepts in research at the intersection of computer systems and AI/ML, as well as an appreciation of how to argue for or against any particular idea. In addition, the course will hone students’ soft skills like teamwork, empathy, communication, and building functional products in agile teams.				
Course Outcomes. After the completion of this course, the student will be able to: 1. Discuss the current trends in AI and has the competence to judge different approaches and technologies. [A] 2. Comprehend and critique relevant research papers in the area of “systems for AI” and “AI for systems”. [F] 3. Present their research both orally in a concise way and within the allotted time as well as in writing. [A] 4. Enumerate strengths and weaknesses of different AI technologies and under what circumstances they can be applied. [E] 5. Defend the research approach, design decisions, and the evaluation methods in a discussion. [D] 6. Design and conduct experiments using AI methods, with emphasis on evaluation. [E] 7. Apply professional and research skills to propose an AI-base system with ability to compare with alternatives [B]				
Assessment Policy	Research Project	50 %	Participation	10 %
	Scientific review article	25 %	Presentation	15 %
Textbook	There is no textbook for the course. Each student is expected to read 1-2 papers per a week. The papers will be selected in advance by the instructor.			

Course Name	Intelligent Internet of Things		ذكاء إنترنت الأشياء			
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)		
	0911-1683	683	3 (3-0-6)	Machine Learning		
Course Track	☐ Program Core		☒ Electives			
Course Description. This course introduces the emerging paradigm known as Intelligent Internet of Things (IIoT) which is a blend of Artificial Intelligence (AI) and Internet of Things (IoT). IIoT is a perfect example of two technologies (AI and IoT) that complement one another and should be tightly connected. Until now IoT is introducing marvelous undeniable applications and contributions and the same applied for AI. Nevertheless, it is the time to move from smart connected devices to artificially intelligent things, services and experiences. In the fast-growing world of IoT, which connects and shares data across a vast network of devices or “things,” organizations win with analytics. For its ability to make rapid decisions and uncover deep insights as it “learns” from massive volumes of IoT data, AI is an essential form of analytics for any organization that wants to expand the value of IoT. This course explores how AI and IoT analytics work together to create new value for organizations across a broad spectrum of industries – from manufacturers and retailers to energy, smart cities, health care and beyond. In other words, from collecting data by smart IoT connected devices to collective learning by AI techniques. This course provides an understanding of the current security requirements in IIoT. Attacks and vulnerabilities specific to IIoT will be explored as well.						
Course Outcomes. After the completion of this course, the student will be able to: 1. Explain the recent contributions of IoT across various application fields. [A] 2. Assess strengths and limitations of various frameworks for IoT and the need for including artificially intelligent things, services and experiences. [A] 3. Explore how AI and IoT analytics work together to create new valuable contributions in IIoT field. [C] 4. Identify security requirements in IIoT as well as attacks and vulnerabilities specific to IIoT. [C] 5. Design and Implement an artificially intelligent things solutions and argue its effectiveness. [E] 6. Review and present scientific research papers in the areas of IIoT and security challenges. [F]						
Assessment Policy (TC)	Assignments	10%	Quiz	10%	Capstone Project	20 %
	Midterm	20%	Final	40%		
Textbook	Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler “Internet of Things: Technologies and Applications for a New Age of Intelligence" 2 nd Edition, Academic Press, 2018. ISBN-13: 978-0128144350.					
References	1. Robert Stackowiak, Art Licht, Venu Mantha, Louis Nagode, “Big Data and the Internet of Things”, Springer Nature, 2015. ISBN-13: 978-1484209875. 2. Krishnendu Chakrabarty, Farshad Firouzi, Sani Nassif, “Intelligent Internet of Things: From Device to Fog and Cloud”, 1st Edition, Springer, 2020. ISBN-13: 978-3030303662.					

Course Name	Project Proposal		مقترح مشروع		
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)	
	0911-1684	684	3 (3-0-6)	Research Methodology	
Course Track	☒ Program Core ☐ Electives				
Course Description. The Project Proposal course emphasizes on the application of the theoretical concepts of software analysis and design learned during the course work. The analysis component comprises of preparing formal Software Requirements Specifications (SRS) document including problem statement, scope, justification, requirements, cost estimation, assumptions, limitations, methodology and tools to be used in project development. The assumption should be taken in such a way that scope of the problem becomes clear and well defined in the problem statement. All the functional and non-functional requirements of the system must be identified and analyzed in the proposal. The students will be encouraged to develop/describe logical model of the proposed system based on the requirements. The design component of the course includes prototype including input and output of the proposed system.					
Course Outcomes. After the completion of this course, the student will be able to: 1. Identify the problem statement. [E] 2. Define and justify scope of the problem. [E] 3. Define and analyze system requirements. [E] 4. Propose and evaluate an optimized solution among the existing solutions. [B] 5. Practice software analysis and design techniques learned during the course work. [E] 6. Prepare and present a technical report. [F]					
Assessment Policy	Committee Evaluation	Report Evaluation	40%	Supervisor Evaluation	30%
		Oral Examination	30%		
Textbook	There is no single textbook for this course. The students are encouraged to select and read various related texts under the recommendation of their supervisor.				
References	1. Jeremy T. Miner, Lynn E. Miner, “Proposal Planning & Writing”, 4th Edition, Greenwood, 2008. ISBN-13: 978-0-313-35674-2. 2. Wayne Booth, Gregory Colomb and Joseph Williams, “The Craft of Research”, 3rd Edition, University of Chicago Press, 2008. ISBN-13: 978-0226065663. 3. William Navidi, “Statistics for Engineers and Scientists”, 2nd Edition, McGraw-Hill, 2010. ISBN: 978-0073376332.				

Course Name	Project Implementation		تنفيذ مشروع		
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)	
	0911-1685	685	6	Project Proposal	
Course Track	☒ Program Core ☐ Electives				
Course Description. In this course, the students will be required to implement the proposed design of the project. The students will review the design specification and make any necessary enhancements to synchronize the implementation details. The students will identify and learn the use of tools required for the project implementation. The students will be expected to: prepare application architecture, code, debug, document, and test the application software within suggested timeframe. A key focus of the course is to emphasize the quality of software project through various evaluation aspects such as professional coding style, documentation of code, intuitive user interface design, input validation, verification and user guide. The students will be further required to evaluate the developed system by generating test cases of the critical components of the designed model.					
Course Outcomes. After the completion of this course, the student will be able to: 1. Design, develop and evaluate a computer-based system to meet a set of solution requirements. [A, E] 2. Prepare proper documentation of software projects following the standard guidelines. [F] 3. Enhance written and oral communications skills with a range of audience [F] 4. Recognize professional, ethical, legal and social issues related to IT. [F] 5. Identify the need for engaging in continuing professional development. [E]					
Assessment Policy	Committee Evaluation	Report Evaluation	40%	Supervisor Evaluation	30%
		Oral Examination	30%		
Textbook	There is no single textbook for this course. The students are encouraged to select and read various related texts under the recommendation of their supervisor.				
References	1. Jeremy T. Miner, Lynn E. Miner, “Proposal Planning & Writing”, 4 th Edition, Greenwood, 2008. ISBN-13: 978-0-313-35674-2. 2. Wayne Booth, Gregory Colomb and Joseph Williams, “The Craft of Research”, 3 rd Edition, University of Chicago Press, 2008. ISBN-13: 978-0226065663. 3. William Navidi, “Statistics for Engineers and Scientists”, 2 nd Edition, McGraw-Hill, 2010. ISBN: 978-0073376332.				

Course Name	Dissertation		الرسالة	
Course Information	Course Code	Course No.	Credit Hour	Prerequisite(s)
	0911-1686	686	9	Research Methodology
Course Track	☒ Program Core		☐ Electives	
Course Description. Student will choose a research topic under supervision of a faculty member. After approval of the dissertation subject, the student needs to define objectives of the research and prepare the research proposal. In the proposal, he/she will be required to (i) conduct an exhaustive survey (ii) identify and define the problem clearly (iii) decide scope of the problem and provide its assumptions and limitations (iv) ensure the originality of the research proposal (v) suggest the approach and methodology used in the research and (vi) present the expected results. At the successful presentation of the proposal, student will be asked to submit the proposal. The student will apply the proposed methodology to solve the problem. After completion, student will submit the dissertation and then student will defend the dissertation.				
Course Outcomes. After the completion of this course, the student will be able to: 1. Conduct a survey of research issues. [B, E] 2. Practice research techniques, tools and methodologies. [E] 3. Work independently and take initiatives in academic or professional environment. [E] 4. Develop writing and oral presentation skills. [D, E]				
Assessment Policy	Dissertation Evaluation	60%	Dissertation Oral Examination	40%
Textbook	There is no single textbook for this course. The students are encouraged to select and read various related texts under the recommendation of their supervisor.			
References	1. Jeremy T. Miner, Lynn E. Miner, “Proposal Planning & Writing”, 4 th Edition, Greenwood, 2008. ISBN-13: 978-0-313-35674-2. 2. Wayne Booth, Gregory Colomb and Joseph Williams, “The Craft of Research”, 3 rd Edition, University of Chicago Press, 2008. ISBN-13: 978-0226065663.			