



COURSE OUTLINE

Course identification

Name of programs – Codes:	COMPUTER SCIENCE TECHNOLOGY – MACHINE LEARNING– LEA.DR COMPUTER SCIENCE TECHNOLOGY –ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING-LEA.DQ
Course title:	INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Course number:	420-A06-AS
Total number of course hours:	60 hours
Weighting:	2-2-2
Statement of the competencies– Codes:	Interact and communicate in various work situations – KP46 Manage structured data – KP57 Manage unstructured data – KP58

Contribution of the course in the program

Course position

This course is located in the first semester of *Computer Science Technology – Machine Learning* (LEA.DR) and *Artificial Intelligence and Machine Learning* (LEA.DQ) programs. Its duration is 60 hours divided into 30 hours of theory and 30 hours of exercises plus approximately 30 hours of homework. In the program LEA.DQ, it shares the development of KP46 competency with *Research, Ethics and Profession* (420-A20-AS) offered in the fourth semester and *Internship* (420-A24-AS) offered in the fifth semester. In the program LEA.DR, it shares that competency with *Research, Ethics, and Profession* (420-A20-AS) offered in the second semester. In the program LEA.DQ, it shares the development of KP57 and KP58 competencies with *Applied Machine Learning I* (420-A14-AS) and *Advanced Data Management* (420-A15-AS) offered in the third semester; and finally, with *AI Applications in Industry* (420-A23-AS) and *Internship* (420-A24-AS) offered in the fifth semester. In the program LEA.DR it shares the development of KP57 and KP58 with *Applied Machine Learning I* (420-A14-AS) and *Advanced Data Management* (420-A15-AS) offered in the second semester; and with *AI Applications in Industry* (420-A23-AS) in the third semester. There are no prerequisites. Finally, even if it is not a prerequisite to any other course, the knowledge and skills developed in this course will be revisited in other courses of the two programs.

Scope of the course

During this course, the student gets an overview of the main concepts and algorithms underlying the understanding and construction of intelligent systems: agents, problem-solving, and machine learning (ML). The student will be familiar with the major problems and methods addressed within these foundational areas in order to recognize system development situations in which these techniques might be fruitfully applied. This course will also provide students with preparation for advanced training in applied Artificial Intelligence (AI) and Machine Learning (ML).

Upon completion of this course, the student will be acquainted with the basic concepts and methods of AI to make use of some elementary techniques to solve narrowly defined problems in the design of computer systems. Furthermore, the student will be able to recognize how AI enables capabilities (e.g. prediction and classification) that are beyond conventional technologies while considering the limitations of current AI techniques. The student will possess insights into how these methods may be used to model the information processing mechanisms of human cognition.

Course components (objective and standard of the competencies)

Expected outcomes (achievement context of the competencies)

The achievement context of these competencies will reflect the conditions as they occur in the following settings: academic, professional, work, or life environment.

Achievement context appropriate to the competency – Interact in a professional setting – KP46

- In various types of work settings
- Using application programming standards, methods and best practices
- Using laws, code of ethics and corporate policies

Achievement context appropriate to the competency – Manage structured data – KP57

- Based on the requirements.
- Based on structured data.
- Based on the appropriate algorithms.
- Using software, devices, and peripherals.
- In accordance with privacy policy.

Achievement context appropriate to the competency – Manage unstructured data – KP58

- Based on the requirements.
- Based on unstructured data.
- Based on the appropriate algorithms.
- Using software, devices, and peripherals.
- Using information sources.
- Using image processing libraries.
- Using image transformation techniques.
- Using convolutional neural networks for visual data.
- In accordance with the privacy policy.

Throughout the course, you will engage in various learning situations/activities so that by the end of the course, you will have met the expected outcomes.

Elements and performance criteria

The elements of an objective formulated in terms of the competency specify its essential components. They include only what is necessary in order to understand and master the competency. If the competency is described as a process, the elements are the steps for execution.

The performance criteria are the specific pre-established requirements upon which you and your teacher can objectively judge your development of the targeted competency. They are part of the description of this competency. They are prescriptive.

Sometimes an element appears in more than one course. If this is the case, a number indicates its complexity level: level one (1) being the simplest, level two (2), average, and level three (3), advanced, at the ministerial level.

Below are the elements of the competencies and performance criteria for this course that are to be respected:

<p>Competency: Interact in a professional setting - KP46 (30h)</p> <p>General ministerial and institutional performance criteria:</p> <ul style="list-style-type: none"> - Demonstration of critical thinking. - Sense of teamwork - Basic understanding of ethics 	
Elements of the competency	Performance criteria specific to each element
2. Examine the regulations relative to the practice of data science	<p>2.1 Relevant recognition of the rights and responsibilities of individuals in the employer-employee and customer-business relationships</p> <p>2.2 Relevant recognition of the consequences of violating the laws and regulations.</p>
4. Working in a team.	<p>4.1 Attitudes and behaviors that demonstrate respect, openness, and a collaborative spirit.</p> <p>4.2 Effective communication with different team members</p> <p>4.3 Proper execution of assigned tasks</p> <p>4.4 Compliance with rules for optimal team functioning</p> <p>4.5 Respect for the organizational culture</p> <p>4.6 Compliance with application programming standards, methods, and best practices</p> <p>4.7 Observance of the limits of the scope of professional intervention and respect for the expertise of team members in other occupations</p> <p>4.8 Adherence to deadlines</p>
5. Become familiar with the legal obligations and rules of professional ethics	<p>5.1 Accurate listing of the main offences and criminal acts in information technology</p> <p>5.2 Accurate listing of the main breaches of intellectual property rights in information technology</p>

	<p>5.3 Accurate assessment of the consequences of offences, criminal acts and breaches of intellectual property and data rights</p> <p>5.4 Appropriate determination of the measures to a given situation.</p> <p>5.5 Compliance with laws, codes of ethics and corporate policies</p>
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<p>Competency: Manage structured data – KP57 (15h)</p> <p>General ministerial and institutional performance criteria:</p> <ul style="list-style-type: none"> • Demonstration of analytical thinking. • Demonstration of curiosity towards different approaches to problem-solving 	
<i>Elements of the competency</i>	<i>Performance criteria specific to each element</i>
1. Analyze the data sources.	<p>1.1 Exhaustive identification of data sources.</p> <p>1.2 Accurate identification of data types.</p> <p>1.3 Accurate analysis of validity and reliability of the data.</p> <p>1.4 Effective analysis of the cost of obtaining data.</p> <p>1.5 Proper determination of data confidentiality policies.</p>

<p>Competency: Manage unstructured data – KP58 (15h)</p> <p>General ministerial and institutional performance criteria:</p> <ul style="list-style-type: none"> • Demonstration of analytical thinking. • Demonstration of curiosity towards different approaches to problem-solving and modeling 	
<i>Elements of the competency</i>	<i>Performance criteria specific to each element</i>
1. Identify the source of the data.	<p>1.1 Accurate analysis of the specifications of the data model.</p> <p>1.2 Appropriate analysis of the documentation.</p> <p>1.3 Efficient selection of the data.</p> <p>1.4 Correct documentation of the findings.</p>

Course content/main themes

Listed below is the **essential** content to be covered in this course:

- Course Introduction
 - An introduction to AI and its history: different views and approaches to AI, intelligent agents, and future directions

- Problem-Solving
 - Solving problems by searching
 - Search in complex environments (Heuristic Search)
 - Adversarial search and games
- Knowledge, Reasoning, and Planning
 - Logical agents
 - Inference in first-order logic
- Uncertain Knowledge and Reasoning
 - Quantifying uncertainty
 - Naive Bayes models
 - Thinking probabilistically (discrete and continuous variables)
- Machine Learning
 - Introduction to supervised learning
 - Introduction to unsupervised learning
 - Introduction to optimization
 - Introduction to neural networks and deep-learning
 - Introduction to reinforcement learning
- Real-world AI Applications (e.g. in Finance, Medicine, Robotics, Education, etc.)
- Philosophy, Ethics, and Safety of AI
- AI-related Positions and Opportunities
- AI Researcher, Data Scientist, MLOps, Machine Learning Engineer, Machine Learning Developer, etc.

Learning activities

Provided below are examples of learning activities that correspond to the competencies for this course. The learning activities are found in the course calendar that complements this course outline.

- Document writing and oral presentation
- Discussion session (allows students to practice the application of the material taught in the lectures)
- Case studies
- Teamwork
- Problem-solving
- Project development in teams

Terms for Evaluating Learning

The evaluation of your learning is based on two inseparable methods: formative evaluation and summative evaluation. These two evaluation types are formal. Detailed information on the evaluation schedule is found in the course calendar, under the “Formative and summative evaluation schedule” column.

Formative evaluation

Following a learning activity or learning period, time is set aside for introspection. You will determine what has been understood and achieved and seek to identify the nature and origin of weak areas. These designated periods consist of simple means: short tests, association games, logbooks, a portfolio, questions, creating of samples, etc.

Formative evaluation is frequent and covers as many aspects as possible. It takes place in class, individually or in groups, and leads to immediate decisions. **You are the one who assumes the bulk of the work during individual or group corrections, adjustments, and other self-evaluation tasks. The purpose is not to determine grades.**

If you take the results of the formative evaluations seriously throughout the course, you will ensure preparedness for the summative evaluations. You will be able to make the necessary progress to acquire the targeted competency at the required level, according to the achievement context and pre-established performance criteria.

Below are some examples of formative evaluation methods that correspond to the targeted competencies for this course:

- Labs practice corrected in class
- Group work on problem-solving
- Case studies treated in class and as homework
- Teacher feedback after students practice exercises
- Case Studies

Summative evaluation

Summative evaluations are less frequent. They take place later on, towards the middle and end of the semester. This gives you the time to integrate your learning and to learn how to apply it to situations related to the targeted competency. The summative evaluation material is prepared by your teacher according to the description of the course's targeted competency: its elements, achievement context, and performance criteria.

The work completed in summative evaluations is graded. The purpose is to determine what you have learned.

Below is the information on the summative evaluation schedule and details for this course, as well as the weighting of marks:

Evaluations	Weighting
Mid-term exam	30%
Project	30%
Final exam	40%
Total	100%

Institutional requirements

Student's commitment

By registering for this course, you commit to:

- *obtain the necessary course materials at the start of the semester;*
- *respect the copyright;*
- *participate in the learning activities, formative and summative evaluation activities outlined in the course calendar;*
- *complete the work assigned to you;*
- *submit the work on time.*

Teacher's commitment

Your teacher commits to:

- *create varied learning situations that enable you to put into practice the knowledge, actions and professional behaviour of the targeted competency;*
- *plan sufficient and appropriate formative evaluation activities, involving correction and improvement, that provide frequent feedback, allowing you to be well informed of your progress;*
- *provide summative evaluations that correspond to the course's targeted competency;*
- *evaluate work according to the applicable criteria, in a fair and equitable manner within a reasonable time.*

The Institutional Policy on Evaluating Learning (IPEL) is applied to all institutional programs. Listed below are a few of its clauses:

Written language (article 5.7)

The teacher is responsible for identifying spelling and grammar errors and for allocating the corresponding number of marks for any given summative evaluation.

Below is the % – based on language requirements – that can be attributed to each summative evaluation:

- *up to 5 %*

Class attendance (article 5.12)

Attendance and participation in classes and evaluations are mandatory for all students.

The teacher has the responsibility of monitoring attendance and of evaluating the reasons justifying student absences from classes.

A student whose absences exceed the allowable number for the course could be denied access to the final exam for that course.

Plagiarism and fraud (article 5.16)

Plagiarism, attempted plagiarism or complicity in plagiarism during an assignment or any evaluated task contravenes the rules. This includes (but is not limited to):

- *the whole or partial presentation (reference, paraphrase, summary, translation, insertion) of the work of another (text, illustration, film, music, etc. on paper or online) as one's own, or failing to cite a source;*
- *the use of another student's exam during an exam;*
- *the use of an assignment done for another course or a project already submitted in the past, which is passed off as an original work.*

Fraud, attempted fraud or complicity in fraud constitutes an infraction.

This includes (but is not limited to):

- *the possession or use of any unauthorized document, material or equipment during an exam, including the use of technological tools;*
- *the execution of an evaluated task by another person;*
- *the substitution for another person during an exam, assignment or any evaluated task;*
- *the possession of the questions or answers of the exam;*
- *the obtainment of any aid not authorized in advance by the teacher.*

Plagiarism, attempts at plagiarism or fraud, or collaboration in plagiarism or fraud are prohibited and considered serious offences. Thus, any instances of plagiarism or fraud will lead to a grade of '0' for the assignment in question. In addition, a note will be made in the student's file and the student will receive a written notice from his or her Program Directorate to that effect.

In the case of recidivism, in the same course or in another course, the student will be given a grade of '0' for the course in question. A second note is made in the student's file and the student will receive a summons from his or her Program Directorate. For a third offence, he or she may be expelled from the College.

Submission of work and tests (article 5.8)

All assignments must be submitted in class at the time designated by the teacher. Any late submissions result in a grade of zero (0).

Upon presentation of an official supporting document or valid reason for the absence, the student may request an extension from the teacher, who may accept or refuse the student's work and apply a penalty for the lateness.

Program Directorates do not accept student work. Assignments must be submitted directly to the teacher.

Rules and regulations to follow

Late arrivals

The teacher may refuse to admit to the classroom any student arriving late. A late arrival is considered an absence for that period.

Note: Students arriving late must recognize that the information they missed will not be repeated. Late students are therefore responsible for asking their peers about the material they missed. Arriving after the break, as well as leaving before the end of the class, may result in one or more hours of absence.

Eating and drinking in class

Eating and drinking are prohibited in the classrooms, locker rooms and Documentation Centre. Food may only be eaten in the cafeteria, vending machine areas and student lounges.

Mandatory course material

- Extra documentation will always be provided in class, as well as posted on Omnivox.
- Laptop with specifications mentioned on the college's website.
LaSalle College. Bring Your Own Device. 2017. < <http://www.lasallecollege.com/future-students/bring-your-own-device> >

Bibliography for this course

- RUSSELL, Stuart., NORVIG, Peter., RUSSELL, Stuart Jonathan. Artificial Intelligence: A Modern Approach. United Kingdom: Pearson, 2020.
- FINLAY, Janet. An Introduction to Artificial Intelligence. United States, CRC Press, 2020.
- GIFT, Noah. Pragmatic AI: An Introduction to Cloud-Based Machine Learning. Addison-Wesley, 2018

Academic Studies Directorate approval:
