



UNIVERSITÀ  
DEGLI STUDI  
DI MILANO

COURSE REGULATIONS  
(art. 12 – Ministerial Decree 22 October 2004 n. 270)

DEGREE COURSE IN  
ARTIFICIAL INTELLIGENCE  
Class L-31 Degrees in Computer Science and Technology  
entering class 2021/2022

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## **PART ONE – GENERAL PROVISIONS**

### **Art. 1 – Name, class, department and duration**

1. The Inter-university Degree Course in Artificial Intelligence has been set up in an agreement between the University of Pavia, the University of Milan and the University of Milan Bicocca (hereinafter Universities) and is coordinated by Department of Mathematics of the University of Pavia. It belongs to class L-31 of Degrees in Sciences and Information Technologies referred to in the Ministerial Decree of March 16, 2007.
2. The normal duration of the degree course is three years.

### **Art. 2 – Regulatory texts**

1. In compliance with the freedom of teaching and the rights and duties of teachers and students, the organisation of teaching and the carrying out of the training activities envisaged for the inter-university degree course are governed by:
  - a) the present Regulations, in accordance with the Convention stipulated between the University of Pavia, the University of Milan, and the University of Milan Bicocca, and by the Statute and the General Regulations of the University of Pavia available at the following link <https://web.unipv.it/ateneo/statuto-regolamenti/>;
  - b) the Course Regulations and Student Regulations of the University of Pavia, available at the following link <https://web.unipv.it/ateneo/statuto-regolamenti/statuto-regolamenti-didattica/>;
  - c) from the Regulations of the Department of Mathematics of the University of Pavia available at the following link: <http://matematica.unipv.it/disposizioni-general-e-organizzazione>.
2. For all matters not expressly provided for in these Regulations, the existing provisions of law apply.

### **Art. 3 - Body responsible for didactic and organisational coordination**

1. In compliance with the competences and criteria established by the Statutes and Regulations indicated in art. 2, the body responsible for the Degree Course is the Teaching Council of the Degree Course in Artificial Intelligence. Pending its establishment, managerial activities are entrusted to a Management Committee comprising an equal representation of teachers from the three Universities as indicated in the Inter-university Agreement.

### **Art. 4 – Administrative services**

1. The administrative services that support the Degree Course are:
  - the Student Administration Office of the University of Pavia, which deals with the administrative management of students' course of studies, from the moment of their entry to the University until graduation (enrolments, transfers, fees, recognition of qualifications, student mobility, etc.). The Student Administration Office is located in Via Ferrata 5, Pavia. The website can be consulted at the page: <http://wcm-3.unipv.it/site/home/ateneo/amministrazione/area-didattica-e-servizi-agli-studenti/servizio--segreteria-studenti.html>;
  - the Orientation Centres of the three universities, which manage activities and projects to guide students in their choice of university subjects, to support students during the progression of their studies, and to facilitate their entry into the labour market by organising group and

individual activities, counselling services, orientation meetings. The websites of the centres active at the three universities are:

<https://www.unimi.it/it/corsi/orientarsi-e-seglia/il-cosp>

<https://www.unimib.it/servizi/bicocca-orienta>

<http://www-oriento.unipv.it/>;

- the Teaching Office of the Department of Mathematics of the University of Pavia:

<https://matematica.unipv.it/>

## **PART TWO – ORGANISATION OF TEACHING ACTIVITY**

### **Art. 5 - Annual Study-Programme Datasheet**

The annual study-programme datasheet (SUA) for the degree course, extracted from the ministerial database, can be consulted at <https://matematica.unipv.it/> under “Didactic Regulations”.

### **Art. 6 – Admission requirements**

1. To enrol in the Degree Course, the student must be in possession of a secondary school diploma or a qualification obtained abroad that is recognized as being suitable by the competent bodies of the University that houses the administrative office. Furthermore, the following requirements are required:
  - knowledge of the English language to at least level B2 so as to facilitate understanding and allow participation in training activities;
  - the ability to understand texts, knowledge of elementary logic, and reasoning skills;
  - knowledge of the basic notions of mathematics that are normally provided at secondary school.
2. For the 2021-2022 academic year, access to the Degree Course is subject to local programming in order to ensure the quality of the educational offer in relation to the resources available.
3. The allocation of available places is conducted in accordance with the resultant ranking of performance in a knowledge test involving English TOLC-I (for information, consult the website <https://www.cisiaonline.it/area-tematica-english-tolc-ingegneria/home-english-tolc-i/>). The times and procedures for carrying out the admission test, as well as registration for the selections will be outlined in an official notice published at <https://web.unipv.it/formazione/iscriversi-a-una-laurea-triennale-o-magistrale-a-ciclo-unico/con-esaurimento-posti-o-con-numeri-chiusi/>.
4. For candidates whose position in the ranking falls within the prescribed number, additional training obligations (OFA) may be envisaged in the event of a low grading in the “Mathematics” section of the test; this grade must be improved within the first year of the course. Details of the minimum threshold, methods of enrolment and the allocation of OFAs will be made public in the official notice, referred to in paragraph 3 above, concerning admission to the Degree Course.

### **Art. 7 – Didactic organisation**

1. The educational activities envisaged for the Degree Course allow for the acquisition of university credits (CFUs) in accordance with current legislation.

2. The overall average learning commitment sustained in one year by a full-time student is conventionally set at 60 CFUs. The Degree Course entails the acquisition by the student of a total of 180 CFUs.
3. Each CFU corresponds to an average of 25 hours of commitment per student, of which at least half is reserved for personal study or other individual training activities, except for activities with a high experimental or practical content.

Teaching activity is organized on the basis of different formats: lectures, class exercises and workshop activities. For each course, the division of the teaching hours into the three formats indicated above is established by the teacher according to the number of credits attributed to the course itself, taking as a reference the following average values:

  - 1 CFU = 8 hours of lectures;
  - 1 CFU = 12 hours of class exercises;
  - 1 CFU = 12 hours of workshop activities;
  - 1 CFU = 25 hours relating to an internship or preparation for the final exam.
4. The university credits corresponding to each training activity are acquired by the student upon passing a final exam, or subsequent to another method of verifying the preparation and skills acquired.
5. Credits accumulated are not considered subject to obsolescence throughout the student's period of study, regardless of its duration, except in cases of forfeiture or renunciation of studies, for which, in the event of re-enrolment, the validation of the credits acquired is subject to an evaluation of their possible obsolescence by the Teaching Council (see art. 14 of the present regulations). In well-motivated special cases, the obsolescence of university credits related to specific training activities can be resolved by the Teaching Council. The obsolescence resolution indicates the methods for recovering obsolete credits, establishing any additional tests that students must undertake for this purpose.
6. The teaching activity envisages each Academic Year being divided into two semesters.
7. Teaching activity will take place at the Milan, Milan Bicocca and Pavia campuses according to rules of alternation that will be published on the Degree Course website. At least three exam sessions are to be held each academic year, one at the end of each semester and one in the autumn. In the sessions held at the end of each semester, at least two separate exam dates must be organised for each course that was taught in that semester. The total number of exams organised for each course cannot be fewer than six per Academic Year.
8. For all courses, regardless of the semester in which the teaching activity was carried out, the dates of the exams are to be distributed over the three subsequent sessions.
9. If the exam relating to a course includes a written and an oral test, both tests together constitute the exam. The interval between two successive exam dates cannot normally be less than two weeks.
10. The publication of the dates of the exams and final tests is carried out by the Department of Mathematics of the University of Pavia within the deadlines set for the completion of the SUA form. Following the publication of the exam calendar, no modifications to it are permitted except in cases of proven necessity that need to be documented by means of a written request addressed to the President of the Teaching Council. In any case, the exam date cannot be cancelled and, except in exceptional cases, it cannot be brought forward.
11. For each Academic Year, the final tests for the conferment of the Degree must take place by 30 April of the following Academic Year. Before that date, these tests can be taken by students enrolled in the previous academic year without the need for re-enrolment.
12. The number of final tests per Academic Year cannot be fewer than four.
13. All resolutions relating to the didactic calendar are made public on the website <https://matematica.unipv.it/> under the heading "Didattica".

## **Art. 8 – Study plan**

1. The study plan comprises the set of compulsory training activities, optional activities and training activities chosen independently by the student in accordance with the didactic regulations of the degree programme.
2. All students are required to submit their study plan annually within the deadlines indicated by the administration.
3. Study plans compiled in accordance with those indicated by the Teaching Council and the choices recommended therein (*standard study plans*, Appendix 1) are approved as a matter of course. The student has the right to submit a different study plan (*individual study plan*), which must in any case satisfy the requirements established by the Course Regulations of the degree program; it entails the acquisition of a number of credits not lower than that required for the achievement of the degree. Individual study plans must be approved by the Teaching Council, which can delegate their examination and approval to a Commission.
4. Each year, it is permitted for students to add extra training activities amounting to no more than 24 CFUs to their study plans. In order to validate their enrolment in a year of the course, students must nonetheless sign up for at least 12 university credits required for the achievement of the degree, except for the final exam. It is necessary to take this restriction into account in the event of students sitting for exams, ahead of time, that pertain to years of the course subsequent to that of enrolment. Upon enrolling in the second-cycle degree course, the student is given the opportunity to request recognition of any surplus exams passed up to a maximum of 18 CFUs.

## **Art. 9 – Joint-degree programmes**

There is no joint-degree programme.

## **Art. 10 - Attendance and curricular prerequisites**

1. There are no attendance requirements. Attendance at lectures, exercises and laboratories is however particularly recommended. Particular methods of checking attendance can be adopted, for workshop activities, at the request of the respective teachers, with the approval of the Teaching Council.
2. There are no prerequisites for the various subjects of the Degree Course

## **Art. 11 – Student elective activities**

1. As regards the training activities independently chosen by the student as per art. 10, paragraph 5, letter a) of Ministerial Decree 270/04 (TAF type D), the Teaching Council proposes a list of recommended courses and activities, without prejudice to the student's right to choose any course (either in Italian or in English), as long as it is consistent with the training project, from amongst those offered and accredited at the University of Pavia, the University of Milan and the University of Milan Bicocca.
2. Among the free choice activities, the inclusion of courses belonging to the offer of limited access study courses, both locally and nationally, is allowed, with the exception of closed-number courses in the sphere of medicine at the national level. The inclusion of courses belonging to the second-cycle degree offer is allowed.
3. A maximum of 3 subjects belonging to the educational offer of second-cycle degrees may be included among the supernumerary courses of the degree course study plan, in compliance

with any established prerequisites. Upon enrolling in a second-cycle degree course, the student is given the opportunity to request recognition of the extra exams taken.

#### **Art. 12 – Internships and placements**

1. Study plans include the possibility of carrying out an internship as an alternative to practical-experimental teaching activities. The student interested in carrying out the internship agrees on the procedures for carrying out the same with the Commission delegated by the Teaching Council.
2. Access to an internship is granted to students who have already acquired at least 90 CFUs.
3. Students granted an internship are entrusted, by the Commission for internships of the Degree Course, with a teacher (university tutor) and, if they carry out their activity in a public or private company, with a company tutor, according to the provisions of the training programme established, and in compliance with the obligations defined in the agreement between the University and the company with which the internship activity is carried out.
4. It is the university tutor's responsibility to verify, in agreement with the company tutor:
  - the conditions of feasibility of the training program
  - the evolution of its implementation and final verification.
5. The procedures necessary for the setting up and launch of the internship and for its formalization are published at the web address <https://web.unipv.it/formazione/tirocini-curricolari-e-internato-di-tesi/>

#### **Art. 13 – Examinations and end-of-course assessments**

##### **A) General rules**

1. All activities that allow for the acquisition of credits conclude with a form of evaluation. The assessment of learning and the related verbalization are carried out by the teacher in charge of the training activity who may work collectively within a commission that is appointed by the Teaching Council in accordance with the provisions of paragraph 2 below.
2. The commissions must consist of at least two members: the first, with the function of President, must be the teacher responsible for the subject in question or, in his/her absence, another tenured teacher, usually belonging to the same scientific-disciplinary sector as the subject or to a related field; any other commission member must normally be chosen from among professors or researchers belonging to the same scientific-disciplinary sector or to similar sectors; In case of need, experts on the subject being examined who are appointed by the Teaching Council can be part of the commissions, on the basis of criteria that ensures they possess adequate scientific prerequisites.
3. A total of more than 20 exams or final assessments cannot be envisaged in the Degree Course. This calculation includes basic, core and integrative training activities, along with activities autonomously by the student. The exams (or methods of evaluation) relative to the autonomously chosen activities are considered as corresponding to a single unit, even when they give rise to more than one exam or evaluation.
4. In the case of courses divided into several integrated and coordinated modules and entrusted to different teachers, the final assessment is carried out collectively by all those teachers responsible for the individual modules. The assessment may take place in separate phases, even relating to distinct parts of the program and possibly conducted at different times, provided that the final decision necessary for the passing of the exam is collegial.
5. All exams must be open to the public.
6. The evaluation of exams is expressed in a mark out of thirty and is recorded in a specific register. University credits are understood to be acquired if the evaluation is equal to or greater than 18/30. In the case of an evaluation of 30/30, the commission can unanimously grant the

maximum *cum laude*. An assessment of insufficiency is not accompanied by a mark, and any annotation in the register, which can be used for statistical purposes, is not included on the student's academic record.

7. For the activities referred to in art. 10, paragraph 5, letter d) of Ministerial Decree 270/2004, a positive evaluation is expressed merely as being satisfactory.
8. Recognition of the CFUs acquired by means of internship activity is carried out by the relative Commission upon the recommendation of the university tutor, who verifies the conclusion of the internship and the achievement of the educational objectives in accordance with what was established at the time the internship application was submitted.
9. Extra exams that fall outside of the periods provided for in art. 7, paragraphs 8 and 10, may be granted:
  - a. to students who have not completed their exam within the set time period, but only at the end of the nominal duration of the Degree Course. Any waivers for exceptional reasons will need to be arranged not only with the teachers of the subjects concerned, but also with the President of the Teaching Council.
  - b. to student-athletes operating in disciplines recognized by the Italian National Olympic Committee or the Italian Paralympic Committee. For these students, extra exam dates are set, at the request of the interested parties, to replace those scheduled if they coincide temporally with sporting commitments of at least national significance. Commitments that impede participation at scheduled exams must be documented to the President of the Teaching Council who will proceed, in agreement with the teacher, to organize a special exam.

## **B) Methods**

1. The methods for evaluating progress are defined by the teacher responsible for the training activity, in compliance with the indications set out in the following paragraphs as well as any coordination approved by the Teaching Council.
2. For each training activity, the methods of verification are made public by the teacher in charge at the beginning of the academic year by means of the "subject datasheet" in the university catalogue of courses (i.e., *Syllabus*: [http://www-4.unipv.it/offertaformativa/portale/ricerca\\_insegnamenti.php?lingua=1](http://www-4.unipv.it/offertaformativa/portale/ricerca_insegnamenti.php?lingua=1)).

The information must specify:

- the type of test (written; oral; written + oral);
- in the case of tests carried out in two phases (for example written and oral), any thresholds that must be overcome in the first phase to be able to access the second, the knowledge necessary to overcome these thresholds, as well as the relative importance attributed to the results of the two phases in determining the final mark.

## **Art. 14 - Final examination and conferment of degree**

1. The qualification is awarded after passing a final test that is aimed at verifying the achievement of the educational objectives of the Degree Course.
2. Three (3) CFUs are awarded for the final exam. It consists of a written report, prepared by the student and typically consisting of a description of the activities carried out and the skills acquired in the internship or in the practical-experimental teaching activities, as well as links to the current state of related knowledge in the artificial intelligence sector. The final paper must document the state of the art in the sector of the activity carried out, with particular reference to aspects pertaining to artificial intelligence.
3. When preparing for the final exam, the student is supervised by a teacher who is responsible for an educational activity within the degree course, and who acts as a tutor.



4. The Teaching Council reserves the right to utilise “anti-plagiarism” IT tools, which are capable of highlighting in written reports any material that has been copied from documents written by others yet not placed in quotation marks, and with no reference to the original source. The ascertainment of a case of plagiarism determines the impossibility of attending the final exam and the opening of disciplinary measures against the student. In the event that the verification is carried out ex-post, all necessary steps to correct the situation will be initiated.
5. The paper must be written in English.
6. The Degree Board is appointed by the Director of the Mathematics Department on the proposal of the President of the Teaching Council and is made up of a minimum number of three members, professors or tenured researchers belonging to one of the three Universities, of which at least two must be tenured professors or researchers responsible for courses taught in the Degree Course. Any teacher-tutors and co-tutors who are not part of the Board can participate but without the right to vote.
7. The Degree Board is chaired by the longest-serving professor of the highest category.
8. The mark awarded for the degree, expressed as a mark out of 110, is the sum of a base score and an increment. The base score is derived from the weighted average of those marks obtained for the exams or tests relating to teaching activities that entail a final grade, taking as a weight the number of credits associated with the individual didactic activity. The weighted average is then reported as a mark out of one hundred and ten. The base score does not take into account the outcome of exams relating to surplus activities. The amount of the increment is decided upon collectively by the Board at the end of the exam by applying the Regulations for the graduation mark established by the Teaching Council.

### **PART THREE – PROVISIONS REGARDING STUDENTS’ COURSE OF STUDY**

#### **Art. 15 - Criteria for recognition of duly-certified, extra-university knowledge and skills**

1. The Teaching Council can validate, for a total number of credits not exceeding 12, knowledge and professional skills individually certified in accordance with existing legislation, as well as further knowledge and skills acquired through training activities at a post-secondary level that have involved a university.  
The Teaching Council, pursuant to Law 240/2010, art. 14, can validate, for a total number of credits not exceeding 6 (within the 12 mentioned above), a student’s attainment of an Olympic or Paralympic medal or the title of world champion, European champion or national champion in disciplines recognized by the Italian National Olympic Committee or the Italian Paralympic Committee.
2. The validation of the acquired credits referred to in point 1 is approved by the Teaching Council, case by case, on the basis of an investigation conducted by a Commission delegated by the Council itself. The type of training activity (TAF) for which the credits to be recognized must be attributed together with the number of credits, within the limits of the law where necessary, are established on the basis of criteria of disciplinary relevance, taking into account the contribution of the activity towards achieving the educational objectives of the Degree Course, its specific contents and their possible obsolescence, as well as the required time commitment. To this end, the application for recognition must be accompanied by all the documentation from which the above elements can be deduced; teachers delegated to the preliminary investigation by the Teaching Council can carry out any further checks deemed appropriate.
3. In the event that the student’s study plan is configured as an individual study plan subsequent to the recognition of the credits acquired, it must be approved by the Teaching Council in accordance with the provisions of art. 8.

## **Art. 16 - Criteria for recognition of credits earned**

1. The Teaching Council decides on the recognition of previous studies for those students who have already obtained a degree from an Italian university and who requested, at the time of enrolling, a reduction of the length of their course. This can be granted after evaluation and validation of CFUs that are considered recognizable pursuant to paragraph 5 below.
2. The Teaching Council decides on the recognition of previous studies that were interrupted due to loss of student status or renunciation of studies for those students who requested, at the time of re-enrolling, a reduction of the length of their course. This can be granted, subject to evaluation and validation of CFUs considered recognizable pursuant to paragraph 5 below.
3. The Teaching Council can validate credits already acquired by the student following enrolment in individual courses at a university.
4. In the event of transfer from another university, the recognition of credits is approved by the Teaching Council in compliance with current legislation.
5. The validation of credits is approved by the Teaching Council, case by case, on the basis of an investigation conducted by a Commission delegated by the Council itself. The type of training activity for which the credits to be recognized must be attributed together with the number of credits, within the limits of the law where necessary, are established on the basis of criteria of disciplinary relevance, taking into account the contribution of the activity towards achieving the educational objectives of the Degree Course, its specific contents and their possible obsolescence, as well as the required time commitment. To this end, the application for recognition must be accompanied by all the documentation from which the above elements can be deduced; teachers delegated to the preliminary investigation by the Teaching Council can carry out any further checks deemed appropriate.
6. In the case of transfer of the student between courses of the same class, the portion of CFUs relating to the same scientific-disciplinary sector, attributed directly to the student, cannot be less than 50% of the credits already accrued.
7. In the event that the student's study plan is configured as an individual study plan subsequent to the recognition of the credits acquired, it must be approved by the Teaching Council in accordance with the provisions of art. 8.

## **Art. 17 - Criteria for recognition of educational activities undertaken at foreign universities**

1. Periods of study carried out by the students of the Degree Course at foreign universities within the framework of international agreements (such as those provided for by the European Erasmus + Program or by other agreements stipulated by the Universities of Milan, Milan Bicocca and Pavia) are recognized as a form of training equivalent to that offered by the Degree Course requiring the same commitment from the student and comprising contents consistent with the training programme. They are also encouraged as a means of cultural exchange and integration to personal and professional training. The "Learning Agreement" (LA) is the document that defines the programme of training activities to be followed abroad to replace some of the activities provided for in the Degree Course; the student must complete it, considering the full coherence of the resultant *curriculum* in terms of the educational objectives of the Degree Course rather than searching for the same subjects.
2. For each student who intends to carry out a period of study at a foreign university, the possibility of recognizing credits acquired abroad is established in advance through the LA, which is signed for approval by the Commission designated by the Teaching Council as Representative for the study activities carried out abroad. It is the responsibility of the Representative to ensure that the LA is consistent with the educational objectives of the Degree Course.
3. At the end of the period of study carried out abroad, the Teaching Council, at the request of the student, on the basis of the LA and in relation to the results achieved and adequately documented

- by the foreign University (in the case of the Erasmus + Program, through the “Transcript of Records”), recognizes the training activities carried out abroad and any marks obtained.
4. The Teaching Council proceeds with the recognition in terms of direct correspondence between one or more training activities present in the study plan, and one or more training activities the credits for which have been acquired at a foreign university.
  5. If training activities, the credits for which have been acquired at the foreign university, have contents relevant to the educational objectives of the Degree Course, but do not have a direct correspondence with any of the training activities included in the study plan, the Teaching Council, on Commission proposal, may authorize the presentation by the student of an individual study plan, in compliance with the declaration of the class and the organization of the Degree Course. For each training activity supported abroad, a corresponding Italian disciplinary scientific sector and the relative number of training credits must be indicated.
  6. As regards activities carried out at a foreign university, for each recognized exam, the Teaching Council assigns a mark corresponding to that achieved abroad.
  7. Study and research activity carried out abroad for the purpose of preparing the final exam or as part of an internship in the context of international agreements (for example an *Erasmus Traineeship*) is recognized by the Teaching Council, provided that it is carried out with documented methods, diligence and results.

#### **Art. 18 - Admission to subsequent years**

1. On account of the numerical programming of access to the degree course, together with the admission requirements defined in the official notices that offer access to the course, applications for “direct” admission to the second and third years will be subject to the availability of places in the contingent of eligible students. In the event of requests exceeding the availability per year, free places will be assigned on the basis of a ranking, drawn up by a specially appointed Commission, on the basis of the criteria indicated in the official notices regarding the degree course.
2. Enrolment in years subsequent to the first year of the course requires the cancellation of any OFAs.
3. Students who are enrolled in other Degree Courses or who are already graduates can transfer to the second year of the course without sitting the admission test, provided that they have previously passed exams that are recognizable by the Teaching Council for the acquisition of between 30 and 69 CFUs. For transfers to the third year of the course they must have acquired at least 70 CFUs that are recognized by the Teaching Council.

**Study Plan for the Degree Course in Artificial Intelligence – 2021-22 Entering class**  
**Class L-31 Degrees in Computer Science and Technology**

**1<sup>st</sup> year**

<b>Code</b>	<b>Subject</b>	<b>CFUs</b>	<b>SSD</b>	<b>TAF</b>
509477	Computer programming, algorithms and data structures	12	INF/01	BASIC
509478	Knowledge representation and reasoning	12	INF/01	BASIC
	Knowledge representation and reasoning – mod. 1	6	INF/01	CORE
	Knowledge representation and reasoning – mod. 2	6		
509481	Calculus	12	MAT/05	BASIC
509482	Theoretical and computational linear algebra	6	MAT/08	CORE
509483	Computational logic	6	MAT/01	CORE
509484	Experimental physics for AI	6	FIS/01	CORE
509485	Cognitive psychology	6	M-PSI/01	INTEGRATIVE

**2<sup>nd</sup> year**

<b>Code</b>	<b>Subject</b>	<b>CFUs</b>	<b>SSD</b>	<b>TAF</b>
509486	Machine learning, artificial neural networks and deep learning	12	INF/01	CORE
509487	Fuzzy systems and evolutionary computing	6	INF/01	CORE
509488	Text mining and natural language processing	6	INF/01	CORE
509489	Probability and statistical inference	12		CORE
	Probability and statistical inference – mod. 1	6	MAT/06,	
	Probability and statistical inference – mod. 2	6	SECS-S/01	

509492	Theoretical and quantum physics for AI	12	FIS/02	CORE
509519	Ethics, law and AI	12	IUS/20	INTEGRATIVE

### 3<sup>rd</sup> year

Code	Subject	CFUs	SSD	TAF
509493	Statistical modelling	6	SECS-S/01	INTEGRATIVE
509494	Brain modelling	6	BIO/09	INTEGRATIVE
	Exams in particular fields of study (see the list of other training activities below). 4 training activities each worth 6 CFUs	24		INTEGRATIVE
	Free choice exam	12		D
502815	<p>INTERNSHIP</p> <p><b>or</b></p> <p>3 Workshops for 3 CFUs (see list below)</p> <p><b>or</b></p> <p>2 Workshops for 3 CFUs (see list below) + AF 509536 (ITALIAN LANGUAGE FOR FOREIGN STUDENTS) – 3 CFUs</p>	9		F – OTHER TRAINING ACTIVITES
509535	Final exam	3		E – FINAL EXAM

**Field of Study 1: Data analysis, communication and marketing – 24 CFUs OF INTEGRATIVE TRAINING ACTIVITIES**

<b>Code</b>	<b>Subject</b>	<b>CFUs</b>	<b>SSD</b>
509495	Data mining and knowledge extraction	6	INF/01
509496	Information retrieval and recommender systems	6	INF/01
509497	Web and social networks search and analysis	6	INF/01
509498	Artificial intelligence for communication and marketing	6	INF/01

**Field of Study 2: Industrial Systems and Health-Care – 24 CFUs OF INTEGRATIVE TRAINING ACTIVITIES**

<b>Code</b>	<b>Subject</b>	<b>CFUs</b>	<b>SSD</b>
509499	Signal and image processing	6	ING-INF/05
	Signal and image processing – mod.1	3	
	Signal and image processing Mod. 2	3	ING-INF/03
509502	Process control, industrial automation and robotics	6	ING- INF/04
	Process control, industrial automation and robotics . mod.1	3	
	Process control, industrial automation and robotics – mod. 2	3	ING-IND/32
509505	Medical applications and health-care	6	ING-INF/06
	Medical applications and health-care – mod. 1	3	
	Medical applications and health-care – mod. 2	3	MED/26
509508	Human-system interaction	6	ING-INF/05
	Human-system interaction – mod. 1	3	
	Human-system interaction Mod. 2	3	M-PSI/01

**Field of Study 3: Brain, Cognition and Society - 24 CFUs di INTEGRATIVE TRAINING ACTIVITIES**

<b>Code</b>	<b>Subject</b>	<b>CFUs</b>	<b>SSD</b>
509511	Logics for practical reasoning and AI	6	M-FIL/02
509512	Brain-inspired neural networks and neural architectures	6	BIO/09 MED/26
	Brain-inspired neural networks and neural architectures – mod.1	3	
	Brain-inspired neural networks and neural architectures – mod. 2	3	
509508	Human system interaction	6	ING- INF/05  M-PSI/01
	Human system interaction – mod. 1	3	
	Human system interaction – mod. 2	3	
509515	Artificial intelligence and society	6	SPS/08



**Field of Study 4: Physics for AI : Environment, Health and Quantum Information - 24 CFUs of INTEGRATIVE TRAINING ACTIVITIES**

<b>Code</b>	<b>Subject</b>	<b>CFUs</b>	<b>SSD</b>
509520	Experimental physics for AI 2	6	FIS/01
509516	Imaging and spectroscopy for environment and health	6	FIS/07
509517	Materials and platforms for artificial intelligence	6	FIS/03
509518	Mathematics for imaging and signal processing	6	FIS/02

LIST OF WORKSHOPS – 3 CFUs – OTHER TRAINING ACTIVITIES

FOR ALL FIELDS OF STUDY:

- WORKSHOP OF MACHINE LEARNING 509521
- WORKSHOP OF COMPUTATIONAL INTELLIGENCE 509522
- WORKSHOP OF SCIENTIFIC CALCULUS 509523
- WORKSHOP OF PHYSICS AND APPLICATIONS 509524

FOR FIELD OF STUDY 1: DATA ANALYSIS, COMMUNICATION AND MARKETING:

- WORKSHOP OF DATA ANALYTICS 509525
- WORKSHOP OF COMMUNICATIONS, MARKETING AND APPLICATIONS 509526

FOR FIELD OF STUDY 2: INDUSTRIAL SYSTEMS AND HEALTH-CARE

- WORKSHOP OF INDUSTRIAL APPLICATIONS 509527
- WORKSHOP OF MEDICAL DEVICES AND SYSTEMS 509528

FOR FIELD OF STUDY 3: BRAIN, COGNITION AND SOCIETY

- WORKSHOP OF COGNITIVE AND BEHAVIOURAL MEASURES 509529
- WORKSHOP OF NEURAL SIGNALS AND BRAIN-INSPIRED SYSTEMS 509530
- WORKSHOP OF ETHICS AND SOCIAL IMPLICATIONS OF AI 509531

FOR FIELD OF STUDY 4: PHYSICS FOR AI

- WORKSHOP OF PHYSICS OF SIGNALS AND DATA PROCESSING 509532
- WORKSHOP OF QUANTUM INFORMATION 509533
- WORKSHOP OF PHYSICS OF IMAGING AND RELATED DATA ANALYSIS 509534