

Class 25 – Physical sciences and technologies

Venue:

Department of Physics, via Madonna delle Carceri 9, tel (+39) 0737 402529, fax (+39) 0737 402853

Web address: https://didattica.unicam.it/esse3/CorsoDiStudio.do?cod_lingua=ita&cds_id=67

Dean of the Faculty of Science and Technology:

Prof. Roberto Ballini, preside.scienze@unicam.it
tel (+39) 0737 402126

Chairman:

Prof. David Vitali, david.vitali@unicam.it
tel (+39) 0737 402540

Student Guidance:

Prof. Roberto Gunnella, roberto.gunnella@unicam.it
tel (+39) 0737 402537

Internazionalization:

Prof. Giovanni Di Giuseppe, gianni.digiuseppe@unicam.it
tel (+39) 0737 402542

Mentoring:

Prof. Pierbiagio Pieri, pierbiagio.pieri@unicam.it
tel (+39) 0737 402534

Student Representatives in the Class Council:

Giovanni Canullo, giovanni.canullo@studenti.unicam.it
Erika Giangrisostomi, erika.giangri@gmail.com

Introduction

Physics is a basic science that has as its main goal the discovery of the basic laws of natural phenomena that occur at all length scales, from the cosmos to elementary particles. Characteristic of physics is an investigation method that is based on a dialectic relation between theory and experiment. The ability to shift between these two methodologies is the most characteristic skill of a physicist. In addition to preparing for scientific research (in universities or research institutes), the study of physics provides a solid scientific base, which can be advantageously applied in the worlds of industrial production and the service sector.

The Faculty of Science and Technology at the University of Camerino offers a comprehensive training in Physics, which is divided into three phases. The first phase corresponds to a three-year degree in Physics which concludes with the awarding of the first level degree, the *laurea in fisica*. There is no requirement for an original thesis, but only a brief dissertation (the *tesina*). The name of the second level degree is *laurea magistrale*. It lasts two years and can be studied after the first level degree. This second degree concludes with a genuine thesis involving original contributions from the student with an average duration of around 9 months to 1 year. This degree gives access to higher level job positions and is a prerequisite for any further continuation of studies.

Students who wish to pursue further studies, in the third phase can choose a Professional Master degrees (typically lasting one year), a Specialized School (for example, the School of Specialization in Health Physics of four years duration, or a course of Doctoral Research. Every year at the University of Camerino a Doctorate in Physics (three-year) is offered, and also quite a few Masters degrees which are open to graduates in Physics (the ones offered are different from year to another).

All teaching activities in courses of study carry a value that is rated in credit points. For the first degree 180 credits are required, while for the second degree 120 credits are needed.

Job opportunities

Graduates of the undergraduate degree in Physics find positions in the Labour Market:

-- In the fields of industry, finance, services and public administration, carrying out technical tasks or professional support in the following areas: i) acquisition and processing of data in the laboratory; ii) monitoring and diagnostics in medical, health and environmental activities or related to energy savings, or conservation and restoration in the field of cultural heritage; iii) analysis and financial management, optimization of human resources, equipment, materials production and socio-economic processes; iv) modelling and numerical simulation of decision making; v) installation, testing and maintenance of complex equipment; vi) quality control, identification of items to be checked, range of tolerance, methods of control;

-- In the fields of training, learning and dissemination of scientific culture, for example as a university professor or a teacher at secondary, post-secondary and technical schools;

Based on experience, graduates in physics find, in general, stable employment in a short time after the Master program. There is limited information on employment prospects of graduates in physics after the first degree; in fact in the past, the majority of students continued their studies through to the second level. However, graduates in the program "Technologies for Innovation", which is more professionally oriented, have all found employment in industry (information technology, electronic, mechanical and chemical sectors) and, a smaller percentage, in local institutions and in the tertiary sector.

Prerequisites

Eligible to register are students who have completed the upper-level middle school diploma or equivalent foreign qualification. The degree course assumes knowledge of basic mathematics (in the fields of Algebra, Geometry and Trigonometry) and training in developing logic-deductive ability, abstraction and empirical observation. In each case there is an orientation interview which may result in a requirement to take supplementary courses.

Assessment of the initial preparation

The recent reforms of Laurea courses (D.M. no. 270/2004) requires all Universities to organize entrance tests to assess the level of preparation of new students and to organize remedial activities when deficiencies are identified.

UNICAM organizes a test which, if not passed, does not preclude enrollment in Courses, but does permit an evaluation of the students' preparation in order to place them in the best possible condition for managing with the University courses.

The test will take place on September 30th 2009.

In the first week of lectures there will also be an English test (placement test) to place each student in an English course appropriate for their knowledge level.

Educational Goals

The graduate in Physics at the University of Camerino, will be able to:

- possess a good knowledge and understanding of classical and modern physics, and of the methods of physics as a whole;
- possess a good knowledge of mathematics, information science and chemistry;
- model a great variety of natural phenomena and of technological problems;
- apply the main experimental techniques, perform measurements in a completely independent way, and critically analyze data.

Expected learning outcomes

1. Knowledge of and ability for understanding	Understand the most important physics theories, a knowledge of their logical structure, the experimental results that support them and physical phenomena they described.
	Knowledge in depth of classical physics and the fundamental elements of quantum physics, the structure of matter and nuclear physics.
2. Knowledge of and ability for applied understanding	Solve problems in physics, knowing how to assess the importance of the various active phenomena and to know how to draw analogies so as to apply known techniques to new situations.
	Be familiar with the main experimental techniques, be able to perform measurements completely independently, and to critically analyse and evaluate experimental data.
	Use the main mathematical tools and numerical methods to perform calculations independently, also using development and adaptation of software.
3. Independent judgement	Identify the key elements of a physical process and create a model with which to work.
	Work in a group and fit in quickly in the workplace.
4. Communication skills	Present the results of research activities or a library search to both a specialized audience and to the general public.
	Use written and oral English effectively, both at a technical level and also for the exchange of general information.
5. Ability to learn	"Learn", that is acquire knowledge in new fields through self-study.
	Conduct bibliographic research in physics and to use the results to develop a project.

Assessment of learning outcomes and examination modalities

The assessment of the knowledge and abilities acquired in an educational activity is carried through the evaluation of a written and/or oral exam at the end of the educational activity. In the case of a laboratory activity, the final evaluation may involve also a practical test in the lab. The result of tests held during the course can also be taken into account. However, the participation to these tests is optional for the students and any negative result will not preclude admission to the final exam. For courses broken up into modules, written and/or oral tests can be held at the end of each module. Learning activities are evaluated by a mark out of thirty, with the possibility of the additional recognition of "*lode*" (with praise). For the allocation of credits for work experience or internship, verification of attendance is required and a report on the activities countersigned by the teacher/supervisor. The evaluation can be expressed with only two possible grades: "satisfactory" or "not satisfactory".

Features of the final exam

The candidate shall prepare a review-type dissertation on a topic agreed to by one of the teachers of the degree. The candidate must then conduct a discussion in front of the Degree Board which will evaluate the candidate's ability to carry out independent study. The degree mark, given as a percentage plus the possibility of the label "*lode*" (cum laude, with praise), will depend on the student's curriculum, on the preparation and scientific level attained at the completion of studies. To determine the degree mark at the end of the exam, the Board first evaluates the actual work completed assigning a mark out of 30. Then the Board determines the degree mark using the following procedure:

- the weighted average is calculated of all the marks out of 30 obtained in training activities, including the mark just obtained for actual work completed, and training activities carried out during the three-year degree, using the Credit Units as the weighting factor;
- the weighted average is transformed into a fraction of 110;
- this fraction is multiplied by a coefficient associated with the duration of the student's academic career;
- to this is added the product of 0.05 times the number of credits attained "*con lode*" (with praise);
- the result of this is then approximated to the closest integer;
- if the mark so obtained is at least 111, the committee may assign the label "*lode*", but only if they unanimously agree.

Organization of the Teaching Program

The acquisition of skills and knowledge by students is recorded as university credits (CFU). Credits represent the task of learning, including individual study, practice exercises and laboratory work, that required to be done by the student for the first degree in Physics.

The average amount of work in a year for a student engaged in full-time university studies and in possession of adequate initial preparation is fixed at 60 credits. To attain the degree in Physics the student must have gained 180 credits.

Normally the program of individual learning activities maintains a consistency in the ratio of around 1 / 3 between the time devoted to assisted teaching activities and the time spent studying individually. The organisation of the Degree in Physics into six semesters and its overall duration (three years) and are only indicative, serving as a reference for the organization of the teaching and for calculating the number of credits. Students can earn these credits and attain the degree in less than three years.

A credit is a standard load of 25 hours of work. A purely indicative qualification, a credit could correspond to 7 hours of classroom lectures, or 6 hours of lectures with an additional of 2 hours of practice exercises. These values may vary depending on the type of teaching. In laboratory courses instead about 50% of the face to face teaching hours is devoted to practical exercises in the laboratory, for which a credit approximately corresponds to 12 hours of directed activities.

Teaching is divided into 2 semesters according to the following calendar:
1-9 October 2009: beginning of the first year courses with the orientation days for freshmen;
October 5: beginning of the first semester for second and third year students; January 29 2010: end of the first semester.

Session I Exams: February 1 2010 to February 27, 2010
Teaching for Semester II: March 1, 2010 - June 11, 2010
Session II Exams: June 14, 2010 to July 31, 2010
Session III Exams: September 1, 2010 to October 2, 2010

The number of credits recognised for the teaching activities of the student's choice is ratified by the Class Advisory Board ("consiglio di classe"); such activities may include, in addition to formal university courses, independent study activities (including in that case the frequency of regular seminar series) provided that they are approved by the Class Advisory Board and that they are adequately documented in the way set out by the Board.

The Class Advisory Board can recognize learning activities from other courses of study, including at other universities, or skills and knowledge of the type indicated in paragraph 7 of Article 5 of Ministerial Decree 509/99. In order to encourage good motivated students to enrol for the Degree in Physics, there is the opportunity for recognition of credits for studies undertaken before enrolment in the same course or before commencement of the related learning activities. In particular there will be recognition of no more than 3 credits for study projects agreed to between the scholastic institution where the student came from and the Class 25 Advisory Board, in cases there exists an agreement between the University and the other institution.

Exemption from fees

Students enrolling for the first time in the Degree in Physics Class 25 are completely exempt from paying the first instalment of tuition fees. To maintain the exemption at the time of payment of the second instalment, the student must have successfully completed at least one exam with a mark of at least 25/30. To maintain the exemption for the second year (November 5), the student must have successfully completed at least 50% of the credits provided by the plan of study with a mark of at least 25/30. Finally, to maintain the exemption for the third year (November 5), the student must have successfully completed at least 65% of the credits provided by the plan of study with an average mark of at least 25/30. Those students who, based on family income, are in the 4th band (income statement certified by ISEE exceeding 32000 Euros annually) are excluded from this exemption.

Mentoring

A mentoring service is provided whose aim is to remove any obstacles to the educational advancement of the student, to provide assistance of a personal nature to overcome problems

of settling in and integrating into a new learning environment, and to provide guidance for the overcoming knowledge gaps in the basic skills.

In particular, a support tutor with pre-set publicised consultation hours will be available for students in the Department of Physics to resolve any organizational or logistical problems, and to explain activities and initiatives promoted by University of Camerino.

There will also be mentoring group meetings, to keep track of teaching activities and to bring forward any criticisms. Additional meetings can meet particular needs or requests, and provide information on: i) optional learning activities from degree courses other than the 25 class, but available and potentially useful to 25 Class students ii) the service Internships & Placements ("*Stage & Placement*"); iii) the international program for student mobility.

Internships and traineeships

The internship/traineeship in the third year are to be made at a research laboratory, possibly outside the University of Camerino, in a laboratory or a company. In this last case, the internship must be chosen from among those approved by the Class Advisory Board and listed on the web database, https://vela.unicam.it/stageunicam/banca_dati.asp.

Educational Curriculum

Presented in detail below is the organization of the different subjects, listing the discipline areas and types of subjects, the divisions into modules, and the number of credits awarded.

The tables present the standard curriculum. However note that, having completed the first year examinations, the student may submit by July 31 for approval by the Class Advisory Board individual curriculum for the following academic year, proposing learning goals other than those proposed in the standard curriculum. The Class Advisory Board is committed to assisting students in development of alternative curricula.

TEACHING ACTIVITIES YEAR 1						
N	Teaching activity	Total number of credits	Modules	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Mathematical Methods for Physicists I	11		MAT/05	a	Mark
2	General Physics I	10		FIS/01	b	Mark
3	Computer science	10	Basic computer science	INF/01 (5)	a	Mark
			Lab of computer science	INF/01 (5)		
4	Experiments of Physics I	10		FIS/01	b	Mark
5	English	9		L-LIN/12	e (5)	Mark
					f (4)	
6	Geometry	10		MAT/03	c	Mark
7	Thermodynamics	5		FIS/01	b	Mark

TEACHING ACTIVITIES YEAR 2						
N	Teaching activity	Total number of credits	Modules	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Chemistry	5		CHIM/03	c	Mark
2	General Physics II	10		FIS/01	b	Mark
3	Analytical Mechanics	10	Differential equations	MAT/05 (5)	c (5)	Mark
			Analytical mechanics	MAT/07 (5)	c (5)	
4	Mathematical Methods for Physicists II	10		FIS/02	b	Mark
5	Experiments of Physics II	10		FIS/01	g	Mark
6	Modern Physics	10	Wave phenomena	FIS/01 (5)	b (5)	Mark
			Wave mechanics	FIS/03 (5)	f (5)	

TEACHING ACTIVITIES YEAR 3						
N	Teaching activity	Total number of credits	Modules	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Statistical Physics	5		FIS/03	d	Mark
2	Quantum Mechanics	10		FIS/02	b	Mark
3	Experiments of Physics III	10		FIS/01	g	Mark
4	Physics of Matter	10		FIS/03	b	Mark
5	Nuclear and Subnuclear Physics	10		FIS/04	b	Mark
6	Stage	5			f	Idoneity
7	Free choice activity	5			d	Mark or idoneity
8	Final exam	5			e	Mark

(#)

- a introductory course
- b core course
- c supplementary course
- d elective course
- e for the final exam and for knowledge of a foreign language
- f other (additional language skills, computer skills, internship/work experience stage etc.)
- g local specific activities
- s stage or internship

INFORMATION FOR THE STUDENTS OF THE PROGRAM IN "TECHNOLOGIES FOR INNOVATION"

Differently from last years, the program in Technologies for Innovation will not start in the academic year 2009/2010. This means that the first year course of this program will not be activated, while the second and third year of the program will be obviously kept active.

Presented in detail below is the organization of the different subjects, listing the discipline areas and types of subjects, the divisions into modules, and the number of credits awarded.

The tables present the standard curriculum. However note that, having completed the first year examinations, the student may submit by July 31 for approval by the Class Advisory Board individual curriculum for the following academic year, proposing learning goals other than those proposed in the standard curriculum.

TEACHING ACTIVITIES YEAR 2 *4-15 (**) ≥ 3						
N	Teaching activity	Total number of credits (*)	Modules (**)	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Experimental Physics	10		FIS/01	b	Mark
2	Measurement methods	5		FIS/01	g	Mark
3	Applied Mathematics	5		FIS/02	b	Mark
4	Computing architectures	5		ING-INF/05	c	Mark
5	Electronic circuits and devices	8		FIS/01	b	Mark
6	Material Science	10	Material Science I	FIS/03 (5)	b (5)	Mark
			Material Science II	FIS/03 (5)	b (5)	
7	Modern Physics	10		FIS/03	b	Mark
8	Chemistry and Technology of Polymers	7	Chem. Techn. Polym I	CHIM/05 (4)	c (4)	Mark
			Chem. Techn. Polym II	CHIM/05 (3)	c (3)	

TEACHING ACTIVITIES YEAR 3 *4-15 (**) ≥ 3						
N	Teaching activity	Total number of credits (*)	Modules (**)	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Economy and Management	10	Management	SECS-P/08 (5)	c (5)	Mark
			Logistics	ING-INF/05 (5)	c (5)	
2	Technologies for data acquisition	8		FIS/01	b	Mark
3	Technologies for process control	10		ING-INF/04	g	Mark
4	Sensors and measurement systems	5		ING-IND/12	c	Mark
5	Material diagnostics	5		CHIM/01	d	Mark
6	Stage	10			f	Idoneity
7	Free choice activity	5			d	Mark or idoneity
8	Final exam	5			e	Mark