



UNIVERSITÀ  
DI CAMERINO

## School of Science and Technology

Master of Science (M.Sc.) Degree Course in  
**Physics**

(Classe **LM-17**)

## UNIVERSITY'S DEGREE COURSE HANDBOOK

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**Course Time:** 2 years

**ECTS:** 120

**Main teaching building:**

Address: **via Madonna delle Carceri 9b, 62032, Camerino (MC), Italy**

**Academic year 2010-2011**

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Web site: <http://www.df.unicam.it/fisica/>

## 2. Introduction

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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 School 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 (Master in Physics). 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 about 9 months. 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 course (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 activated, enabling students to start a research activity at international level.

Graduates of the undergraduate degree in Physics find positions in the Labour Market in the fields of industry, finance, services and public administration. They carry out technical tasks or professional support in monitoring and diagnostics in medical, health and environmental activities or related to energy savings, or conservation and restoration in the field of cultural heritage. They also carry out analysis and financial management, and quality control, taking part to the identification of items to be checked, range of tolerance, methods of control.

**The whole Master Degree in Physics is held in English.**

## 3. Learning outcomes and verification modalities

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

- possess a deep knowledge of classical and modern physics, and of the methods of physics as a whole;
- apply advanced calculus techniques, of both formal and numerical nature;
- 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, from classical physics to modern physics, to be familiar with the logical structure, the experimental results that support this, and the physical phenomena described by it.
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.
	Apply research methods in physics to other fields, of both an academic and industrial nature.
3. Independent judgement	Identify the key elements of a physical process and create a model with which to work; to adapt existing models to new experimental data.
	Understand the nature and details of research in physics, to design new procedures both theoretical and experimental.

	Work in groups, to act with considerable independence and to assume responsibility for management of facilities and planning activities.
4. Communication skills	Present the results of research activities or a library search to both a specialized audience and to the general public.
	Use fluent English, both written and oral, especially in the technical-scientific field.
5. Ability to learn	"Learn", that is acquire knowledge in new fields through self-study, and to retain the actual knowledge and actual working methods.
	Conduct bibliographic research in physics and to use the results to develop research of an original character.

#### 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. Learning activities are evaluated by a mark out of thirty, with the possibility of the additional recognition of "lode" (with praise).

#### 4. Admissions rules and entry requirements (D.M. 270/04)

Those eligible to register for the Master degree in Physics (Laurea magistrale di Fisica) are students possessing a three-year university degree or equivalent foreign qualification.

The student who wants to enroll to the Master in Physics must possess a good knowledge and understanding of

- Classical Physics
- Quantum Physics
- Mathematical Analysis
- Geometry and Linear algebra
- Basic experimental techniques
- Use of basic computing systems and their application to data acquisition and processing.

The student must possess a good command of written and oral english, equivalent to the level of the Cambridge Preliminary English Test (PET).

#### Assessment of the personal preparation of eligible students

As required by article. 6, paragraph 2, of D.M. no. 270/2004, in order to be accepted into the Master degree in Physics, a student must be in possession of an appropriate transcript of studies as well as appropriate knowledge and skills.

In order to enrol in the Master degree in Physics a student must be in possession of a transcript of studies that satisfy the following two criteria :

- a) Passed examinations corresponding to at least 70 credits in the field of physics (SSD FIS/01-08);
- b) Passed examinations corresponding to at least 30 credits in the field of mathematics and computer science (SSD MAT/01-09, INF/01, ING-INF/05).

All students with a Bachelor degree in Physics or equivalent can be directly enrolled in the Master in Physics provided they satisfy the following conditions

- Final mark of at least 95/110
- Bachelor degree in Physics acquired in no more than 72 months from enrollment in the Physics course
- Bachelor degree in Physics acquired not more than 48 months from the date of application to enroll in the Master degree in Physics

For all other students, assessment of whether they possess the required knowledge will be conducted by a Committee nominated by the Course Advisory Board. This assessment will follow a seminar to be held before registration. The Committee will decide on the basis of the curriculum of studies (integrated when deemed necessary with a program of additional designated courses) and of the seminar. The Committee will decide on the date of the seminar for each candidate.

In all cases, the Course Advisory Board may approve enrollment into the Master degree in Physics dependent on an assignment of an additional personalised program of studies, in accordance with the rules and objectives of the Master course.

For students with a first level Degree in Physics there is the possibility of conditional registration ("sub condizione") for the Master degree in Physics. The conditions are that by October 1 2010 the student must have obtained at least 165 credits, and that by April 15 2011 they must have attained their Degree in Physics.

## 5. *Job opportunities*

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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;

According to recent statistics, on a national scale, the employment rate of master graduates in physics one year after the degree is 90%. By considering a wider sample including master graduates in Physics in the last 5 years, about 50% of them work in industry, 25% carry out research activities, 13% teach in lower and upper middle schools and 12% work in the tertiary sector. Among those working in industry, the majority work in electronics, followed by the IT sector, then the mechanical and electrical sectors.

## 6. *Teaching organization*

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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.

A credit corresponds to a standard load of 25 hours. For learning activities for the first degree in Physics, a credit corresponds to 7 hours of face to face classroom lectures or 12 hours of classroom exercises. In laboratory courses on the other hand, about 50% of the hours of face to face teaching are devoted to practical exercises in the laboratory, for which a credit corresponds approximately to 12 hours of guided activities.

Teaching is divided into 2 semesters according to the following calendar:

Teaching for Semester I: October 4 2010 – January 28 2011.

Session I Exams: January 31 2011 – February 26 2011

Teaching for Semester II: February 28 2011– June 10 2011

Session II Exams: June 13 2011 – July 30 2011

Session III Exams: September 1 2011 – October 1 2011.

### **Study plans**

In the 2009/2010 academic year there will be two different programs ("curricula" ) for the Master course in Physics: a General Physics course and an Applied Physics course. The program in Applied Physics is a bi-national program organized in conjunction with the Politechnika Gdańska that will award a double degree in the field of Physics and its applications.

### **General Physics plan**

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 the student may submit for approval by the Class Advisory Board an individual curriculum proposing learning goals other than those proposed in the standard curriculum.

<b>TEACHING ACTIVITIES YEAR 1</b>						
N	Teaching activity	Total number of credits	Modules	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Electromagnetism	6		FIS/01	b	Mark
2	Theoretical Physics I	6		FIS/02	b	Mark
3	Complements of Mathematical Physics	6		MAT/07	c	Mark
4	Numerical Methods of Physics	6		MAT/08	c	Mark
TWO COURSES AMONG THE FOLLOWING ONES						
5 -- 6	Statistical Mechanics	6		FIS/02	b	Mark
5 -- 6	Condensed State Physics	6		FIS/02	b	Mark
5 -- 6	Many Body Physics	6		FIS/02	b	Mark
5 -- 6	Theoretical Physics II	6		FIS/02	b	Mark
5 -- 6	Quantum Information	6		FIS/02	b	Mark
5 -- 6	Quantum Computation	6		FIS/02	b	Mark
CHOOSE EITHER ONE LAB COURSE AND THREE COURSES OF 6 CREDITS, OR TWO LAB COURSES AND ONE COURSE OF 6 CREDITS						
7 -- 10	Laboratory of Physics of Matter	12		FIS/03	b	Mark
7 -- 10	Laboratory of Nuclear Physics	12		FIS/04	b	Mark
7 -- 10	Laboratory of Quantum Optics	12		FIS/03	b	Mark
7 -- 10	Physics of Solids	6		FIS/03	b	Mark
7 -- 10	Quantum Optics	6		FIS/03	b	Mark
7 -- 10	Physics of Nanotechnologies	6		FIS/03	b	Mark
7 -- 10	Renewable energies: materials and technologies	6		FIS/03	b	Mark
7 -- 10	Atomic Physics	6		FIS/03	b	Mark

<b>TEACHING ACTIVITIES YEAR 2</b>						
N	Teaching activity	Total number of credits	Modules	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
1	Free choice activity	12			d	Mark or idoneity
2	Master thesis	42			e (final exam) 30	Mark
					f (computer skills) 6	
					f (internship) 6	

## Applied Physics plan

The program in Applied Physics is a bi-national program organized in conjunction with the Politechnika Gdańska that will award a double degree in the field of Physics and its applications. In detail, the University of Camerino will award the Master degree in Physics, in the "Applied Physics" program. Simultaneously the Politechnika Gdańska will award the Master Degree in Applied Physics of the Faculty of Applied Mathematics and Physics, either in the program "Applied Physics" or in the program "Physics and Energy Conversions", depending on the prior curriculum of studies followed by the student.

The maximum number of students of the program is 20 (twenty) each year, ten from each institution. This maximum number can be varied, while maintaining the number of students from each institution equal. Students registered for the bi-national program will be registered at both institutions. Registration fees, however, will be payable only to the University of origin. Students coming from UNICAM will attend the first year of the Master program at UNICAM and the second year at the Politechnika Gdańska. Students coming from the Politechnika Gdańska will attend the first year of the Master program at the Politechnika Gdańska and the second year at UNICAM.

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 the student may submit for approval by the Class Advisory Board an individual curriculum proposing learning goals other than those proposed in the standard curriculum.

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	Electromagnetism	6		FIS/01	b	Mark
2	Theoretical Physics I	6		FIS/02	b	Mark
3	Complements of Mathematical Physics	6		MAT/07	c	Mark
4	Numerical Methods of Physics	6		MAT/08	c	Mark
5	Free choice activity	6			d	Mark or idoneity
CHOOSE EITHER ONE LAB COURSE AND THREE COURSES OF 6 CREDITS, OR TWO LAB COURSES AND ONE COURSE OF 6 CREDITS						
6 -- 9	Laboratory of Physics of Matter	12		FIS/03	b	Mark
6 -- 9	Laboratory of Nuclear Physics	12		FIS/04	b	Mark
6 -- 9	Laboratory of Quantum Optics	12		FIS/03	b	Mark
6 -- 9	Physics of Solids	6		FIS/03	b	Mark
6 -- 9	Quantum Optics	6		FIS/03	b	Mark
6 -- 9	Physics of Nanotechnologies	6		FIS/03	b	Mark
6 -- 9	Renewable energies: materials and technologies	6		FIS/03	b	Mark
6 -- 9	Atomic Physics	6		FIS/03	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	Free choice activity	12			d	Mark or idoneity
2	Master thesis	48			e (final exam) 30	Mark
					f (computer skills) 6	
					f (internship) 6	
					f (other) 6	

- 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.)

### Specific rules of the Master thesis for the program in Applied Physics

At the end of the bi-national program, the student will prepare a Master thesis under the joint supervision of an Italian University Professor and a Polish University Professor. The Master thesis will be written and presented in English. Three copies will be prepared according to the Regulations of the Politechnika Gdańska and delivered to the Students' Office of the Faculty of Applied Mathematics and Physics. One copy will be prepared according to the Regulations of the University of Camerino and delivered to the Students' Office of UNICAM.

The reports of the supervisors and of the referees of the Master thesis will be prepared in English and they will contain both the mark expressed according to the Regulations of the Politechnika Gdańska and the mark expressed according to the Regulations of the University of Camerino. Two separate reports will be prepared: one in Italian and English, written according to the Regulations of the University of Camerino; and one in Polish and English, written according to the Regulations of the Politechnika Gdańska.

The defence of the Master thesis will take place only once provided there is at least one professor present from the other institution to serve on the local Board for the final exam. If this condition cannot be satisfied, the defence of the Master thesis will take place separately at both Universities.

### Free choice activities (valid for both plans)

The number of credits recognised for the teaching activities of the student's choice is ratified by the School of Science and Technology; 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 School of Science and Technology and that they are adequately documented in the way set out by the School. The student in particular can choose as free choice activity one of the courses which have not been chosen among the lists above, courses of the other Master programs of the School of Science and Technology, or some of the courses which are activated every year as free choice courses of the Master program in Physics. The free choice activities activated for the Academic year 2010/20101 are

ADDITIONAL FREE CHOICE ACTIVITIES						
N	Teaching activity	Total number of credits (*)	Modules (**)	Credits per SSD	Typology (a,b,c,d,e,f,g,s) (#)	Mark or idoneity
	Physics of disordered systems	6		FIS/03	d	Mark
	Computer design of materials and complex molecules	6		FIS/03	d	Mark
	Physics of Information Technology	6		FIS/02	d	Mark
	Biological Physics	6		FIS/03	d	Mark

### Features of the final exam

The candidate must prepare a dissertation on an original research topic in a field of physics. The candidate must then conduct a discussion in front of the Degree Board which will evaluate the candidate's contribution to the work presented. The dissertation must be written in Italian or English.

The degree mark, which can reach a maximum equal to 110 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 work done for the dissertation and its presentation 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 the dissertation, using the number of credits as 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 110, the committee may assign the label "lode", but only if they unanimously agree.

## **7. Teaching activities and teachers**

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Attachment A of this handbook contains in detail any information about active courses and relative teachers offered by School of Science and Technology and Degree Course for first and second year's students.

## **8. Curricula for teachers, programs of individual learning activities, educational facilities**

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The programs of individual learning activities with their descriptions are made available by teachers on the University website, under the section 'Courses'.

Through this "gateway" it is possible to access the course lecturers' CVs and a description of the educational and scientific facilities available.

## **9. Teaching support services**

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### **• Post-graduate orientation**

There is often a disconnect between the learning program at a university and the reality of the workplace into which the student needs to enter. The orientation service provides guidance both to those graduating and to postgraduates, in collaboration with the Internship and Placement Service, as well as room for reflection on the choices of support activities for vocational training. The initiative "Young People + University = Work" is of particular relevance here. This takes place each year, generally in the autumn. University students and new graduates are invited to attend the event to have an opportunity to listen to the accounts given by many different professionals, to meet and to establish direct contacts with company representatives, and to get to know experts from the world of work so they can start to plan out their own personal career path.

### **• The mentoring program**

Mentoring contributes to the cultural and professional training of the student, encouraging wider and more and active participation throughout the entire degree course.

The mentoring program has the following objectives:

- Assist the student in all aspects of their study
- Encourage different ways of participating in the training process
- Remove barriers to education through initiatives tailored to the needs, aptitudes and requirements of each individual student.

Unicam's Mentoring Program uses and provides specific tutoring activities for both groups and individuals.

It organises a flexible range of teaching tutorials during the teaching year, conducted by tutors who have been chosen for their particular profiles aimed at activities for students who work and for the different teaching approaches required for e-learning.

- Group Tutoring: provides scheduled meetings with the course teachers, designed to highlight and resolve, also through input from the students, any problems encountered in the teaching course.
- Individual Tutoring: UNICAM assigns to each student a 'teaching tutor' whose task is to follow and advise the student throughout their course of study through regular meetings and through meetings requested by the student.

### **• The opportunity to study abroad**

Unicam offers many possibilities for international mobility:

### ERASMUS for study

The program allows you to spend a period of study abroad (from 3 to 12 months), providing the opportunity to take courses, to take advantage of university facilities, to conduct research aimed at drafting your degree thesis, and to obtain recognition of exams taken abroad, provided they have been pre-designated in an appropriate study program.

Students who are interested can take part in the annual call from the University published in the period December - February.

### Erasmus Student Placement (internship)

Starting in the 2007/2008 academic year, within the Erasmus program it is possible to hold internships (from 3 to 12 months) in enterprises, in research centres, and in European training centres, ensuring a recognition of curricular activities carried out abroad, provided there is agreement in advance with their respective Erasmus coordinators.

The Degree in Physics has established agreements within the Erasmus program with the following European universities:

Country	University	Language	Duration	Learning Activities
Czech Republic	Czech Technical University in Prague	ENGLISH	10 months	<i>Courses/Final test</i>
Spain	Universidad de Extremadura	SPANISH	6 months	<i>Courses/Final test</i>
France	Université Pierre et Marie Curie Paris VI	FRENCH	6 months	<i>Courses/Final test</i>
France	Université Louis Pasteur Strasbourg	FRENCH	3 months	<i>Courses/Final test</i>
Poland	Politechnika Gdanska	ENGLISH	6 months	<i>Courses/Final test</i>
Romania	University of Bucharest	ENGLISH	6 months	<i>Courses/Final test</i>
Romania	Valahia University of Targoviste	ENGLISH	6 months	<i>Courses/Final test</i>
Germany	Rheinische Friedrich-Wilhelms Universität Bonn	GERMAN	6 months	<i>Courses/Final test</i>
United Kingdom	University of Surrey	ENGLISH	6 months	<i>Courses/Final test</i>
Romania	Universitatea Transilvania Din Brasov	ENGLISH	6 months	<i>Courses/Final test</i>
Bulgaria	Sofia University Saint Kliment Ohridski	ENGLISH	6 months	<i>Courses/Final test</i>

### • Internships

The connection between the university and work is one of the priorities at Unicam. Unicam organises meetings and dialogues amongst students, graduates, professionals and companies. In this spirit, the internship is an important tool allowing students, both graduates or recently graduated, to 'practice' in a real working environment, an opportunity to learn directly about working-life and the opportunity to develop, in some cases, a specific expertise.

The University of Camerino has agreements with more than 1800 companies, institutions, administrative and professional offices, where students, both graduates and PhD students, may pursue their internship activities. You can do an internship both in Italy and abroad.

#### Services offered

- Management of a database (Unicam Stage) through which internships are offered, to be carried out at companies or at public and private agencies
- Activation of post-graduate internships in companies
- Insertion of the CVs of UNICAM graduates in the online database UnicamJob
- Support activities during entry in the workplace
- Participation in the program 'Work Kit' ('Borsa Lavoro') (a net of online services and an open system for assembling inquiries and offers of work via the Internet: [www.unicam.it/laureati/mondolavoro/index.asp](http://www.unicam.it/laureati/mondolavoro/index.asp))

### • Services for welcoming students with disabilities

The 'Welcome Service for Disabled Students' aims at providing students with disabilities equal opportunities in dealing with their studies and the chance to fully live the college experience.

This objective is pursued through outreach activities, through technology, and through staff specially dedicated to students and to the removal of the physical and cultural barriers standing in the way of learning and in the way of everyday life.

By contacting the Service Tutors, it is possible map out a training plan, taking into account the particular disability and the individual goals, through the defining of solutions and through personalised participation.

**Facilities and services:**

- Technological aids and directed teaching support
- Personalised examinations (for entry and achievement)
- Specialised tutoring
- Transport and relocation
- Procurement and delivery of library materials
- Exemption and reduction of taxes
- Furnished housing with a possible subsidy
- For the companion
- Access to university facilities
- Counseling
- Access to the sports facilities of C.U.S.
- Grants towards participation in the Socrates / Erasmus programmes
- Internships and training directed towards finding employment

## 10. *Quality assurance system*

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The UNICAM quality management system **certificate ISO 9001:2008** (from **AFAQ-France**, a French leader and one of the first certification bodies at the global level) guarantees students the quality of services provided. The guarantee is via a rigorous analysis of internal organizational procedures and the prompt addressing of any defects whether detected or reported by the students themselves. The Quality Management System includes the following support services for students: orientation, mentoring, international mobility, internships and placement, communication. These integrate with and support the educational activities, so as to contribute to the complete training of the student.



## 11. *Other useful information*

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Internet Site of the University: <http://www.unicam.it>

Internet Site of the School of Science and Technology: <http://fast.unicam.it>

Internet Site for the Undergraduate Course in Physics: <http://www.df.unicam.it/fisica/>

Internet Site for Teaching: [http://web.unicam.it/studenti/guida\\_studente.asp](http://web.unicam.it/studenti/guida_studente.asp)

## Annex A

### I Year

Attività formativa	Modulo	SSD attività	Semestre	Tipologia attività (*)	CFU	n. ore lez.	ore eserc	ore lab	Docente Cognome	Docente Nome	Scuola di appartenenza
Electromagnetism		FIS/01	I	b	6.0	42			Marzoli	Irene	Scienze e tecnologie
Theoretical Physics I		FIS/02	I	b	6.0	42			Pieri	Pierbiagio	Scienze e tecnologie
Complements of Mathematical Physics		MAT/07	I	c	6.0	42			Mangiarotti	Luigi	Scienze e tecnologie
Numerical Methods of Physics		MAT/08	II	c	6.0	21	27		Mancini	Giorgio	Scienze e tecnologie
Statistical Mechanics		FIS/02	I	b	6.0	42			Marini Bettolo	Umberto	Scienze e tecnologie
Condensed State Physics		FIS/02	I	b	6.0	42			Strinati Clavanese	Giancarlo	Scienze e tecnologie
Many Body Physics		FIS/02	II	b	6.0	42			Pieri	Pierbiagio	Scienze e tecnologie
Theoretical Physics II		FIS/02	II	b	6.0	42			Neilson	David	Scienze e tecnologie
Quantum Information		FIS/02	II	b	6.0	42			Mancini	Stefano	Scienze e tecnologie
Quantum Computation		FIS/02	II	b	6.0	42			Mancini	Stefano	Scienze e tecnologie
Laboratory of Physics of Matter		FIS/03	II	b	12.0	42		54	Gunnella	Roberto	Scienze e tecnologie
Laboratory of Quantum Optics		FIS/03	I	b	12.0	42		54	Di Giuseppe	Giovanni	Scienze e tecnologie
Physics of Solids		FIS/03	II	b	6.0	35	12		Di Cicco	Andrea	Scienze e tecnologie
Quantum Optics		FIS/03	II	b	6.0	42			Tombesi	Paolo	Scienze e tecnologie
Physics of Nanotechnologies		FIS/03	I	b	6.0	42			Gunnella	Roberto	Scienze e tecnologie
Laboratory of Nuclear Physics		FIS/04	I	b	12.0	42		54			
Renewable energies: materials and technologies		FIS/03	II	b	6.0	42			Murri	Roberto	

Atomic Physics		FIS/03	II	b	6.0	42			Marzoli	Irene	Scienze e tecnologie
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## II Year

Attività formativa	Modulo	SSD attività	Semestre	Tipologia attività (*)	CFU	n. ore lez.	ore eserc	ore lab	Docente Cognome	Docente Nome	Scuola di appartenenza
Physics of disordered systems		FIS/03	II	d	6.0	42			Di Cicco	Andrea	Scienze e tecnologie
Computer design of materials and complex molecules		FIS/03	II	d	6.0	21		27			
Physics of Information Technology		FIS/02	II	d	6.0	42			Neilson	David	Scienze e tecnologie
Biological Physics		FIS/03	I	d	6.0	42			Zoli	Marco	Scienze e tecnologie

### Legend:

- (\*)
- 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.)
  - s stage