UNIVERSITÀ DEGLI STUDI DI FERRARA
FACOLTA' DI SCIENZE MATEMATICHE FISICHE E NATURALI

Master School in Physics

SCHOOL REGULATIONS and PROGRAM
ACADEMIC YEAR 2010-2011
(Applications Fall 2010)

Web site	**http://www.unife.it/scienze/lm.physics**
Course Chair	Prof. Roberto Calabrese, e-mail **calabrese@fe.infn.it**
Course Manager	Dr.ssa Elisa Marchetti **elisa.marchetti@unife.it**
Secretariat	Via Savonarola, 9 **segreteria.scienze@unife.it** Tel. +39-0532.293303 **http://www.unife.it/studenti/offerta-formativa/orari-e-recapiti**
Deadlines	Applications before **September 30, 2010** Verification of candidate qualifications and Physics background: **from October 1 to December 31, 2010** Registration before **December 31, 2010**
Vacations:Christmas	From December 23, 2010 to January 7, 2011 (included)
Vacations: Easter	From April 21, 2011 to April 27, included

Note:In the Academic Year 2010-2011 the new two-year course of Laurea Magistrale in PHYSICS is started. Of course, only the first year will be taught in the AY 2010-2011.

APPLICATION	FREE APPLICATIONS. The CCS (Consiglio del Corso di Studi, i.e. the body of the teachers) will **evaluate the degrees and also the scientific background** of each applicant, to make sure that it matches the level of the course. If assessment is positive, the applicants can register.
TEACHING AND ATTENDANCE	"IN PRESENZA" The "Corso di laurea" teaching is based on standard lectures to the student audience. Students are required to attend laboratory courses: a maximum absence to 1/3 of lectures/activities is tolerated.
SCHOOL LENGTH	TWO YEARS

GOALS AND PROGRAM	The goal of the Master School in Physics is a strengthening in the mastery of classical and modern Physics, as well as of the scientific method, together with a solid scientific and operative preparation in the chosen specialization field. These goals require adequate skills in the handling of mathematical and computing tools and techniques, and also familiarity with modern instrumentation and advanced data analysis. With these objectives, the Master in Physics is structured in a first part in which the basic facts learnt in the first three-year School are thoroughly investigated, especially in the subjects of Mathematics, Electromagnetism, Quantum Mechanics and its applications, and Scattering theory; and in a second part in which the studies concentrate on a field where research is done in our Physics Department. The school activity then turns into the study of the frontier developments, both theoretical and experimental, of the chosen research domain, also with up to date experimental and data analysis techniques. This 2-year route ends with the final test, a real research autonomously executed, original, which can be carried either in the University labs or in Research Centers or in private enterprises.
Professional Career prospects	Career prospects with a "Laurea Magistrale" LM in Physics, i.e. 2 further years of study beyond LT (three-years school) This 2-year specialization school aims at preparing graduates with deeper and advanced knowledge in theoretical and experimental Physics, together with a specialized expertise in the chosen field. The student of such school, i.e. an LT graduate, will be able after completion to: -- upgrade her/his education with PhD studies -- access to research jobs both in Universities and in research Institutions -- take up R&D careers in private firms -- teach science in high schools and Universities. In the Italian public administration, a LM graduate can be hired as: 2.1.1.1.1 Physicist 2.1.1.1.2 Astronomer and Astrophysicist 2.2.2.5.3 Geophysicist 2.1.1.5.4 Meteorologist 2.3.1.1.3 Biophysicist 2.6.2.0.1 Researcher and Graduate technician in Physical Sciences
DEGREE FOR REGISTRATION	A sufficient requirement for acceptance is possession of Italian Laurea or three-year Diploma Universitario in Physics, **as well as any other degree obtained abroad, which is evaluated to be equivalent by this University CCS.**
DEADLINES FOR APPLICATION AND FOR REGISTRATION	**Application must be submitted no later than SEPTEMBER 30, 2010**. The document list requested is indicated in; http://www.unife.it/studenti/immatricolazioni-e-iscrizioni/modalita2019-di-immatricolazione-on-line **Registration deadline is DECEMBER 31, 2010.**
SCIENTIFIC BACKGROUND REQUIRED FOR ACCEPTANCE	Scientific background assumed in the course includes: – Good practical knowledge of Calculus, Geometry and Algebra. – Basic notions of Chemistry. – Good understanding of basical Classical Mechanics, Thermodynamics, Electromagnetism and Optics. – Familiarity of experimentation and its techniques; basic electronics. – Knowledge of the main theories in Classical and Modern Physics, Special Relativity, Quantum Mechanics and relative mathematical methods, and elements of Statistical Mechanics. – Sufficient mastership of the English language to understand Physics textbooks in English and lectures in English. – Computing skills : ability to use existing scientific programs. – Ability to understand and solve (or at least know how can be solved) Physics problems.
THE ASSESSMENT OF THE PHYSICS BACKGROUND.	The evaluation of the applicant's qualifications and Physics background will be done by an Evaluation Committee appointed by the CCS, via an **Admission interview** on the basic knowledge requested and the applicant's own motivation and interests, in order to determine: 1. Acceptance of the applicants for registration .

	2. Structure of courses avoiding repetition of already known subjects and considering the applicant's own interests. **First evaluation: 15th October 2010 hour 3PM at Physics Department Building C - Scientific-Technological Campus, via Saragat, 1, 44122 – Ferrara.**
CALENDAR OF LECTURES	The Course teaching year is structured in two semesters, each followed by two exam sessions. During exam sessions there are no lectures. The calendar of lectures and exams is as follows: **1° Semester** lectures September 27. 2010 – January 21, 2011 exams January 24, 2011 – February 25, 2011 **2° Semester** lectures February 28, 2011 – June 10, 2011 esami June 13, 2011 – July 29, 2011 **"Second Chance" exams** September 1, 2010 – September 27, 2011

Course structure and regulation

The Laurea Magistrale LM in Physics is normally obtained in 2 years after having acquired 120 credits. A student who has obtained the 120 credits required by the curriculum can attain the LM even before completing the two years of the school.

Types of courses	**B = Basic** B1 – Experimental and practical applications B2 – Theoretical and on the fundamentals of Physics B3 – Microphysics and the Structure of matter. B4 – Astrophysics, Geophysics and Space Physics. **C = Related or supplementary** **D** = **Optional** (Student's choice) **E1** = **Foreign language** **E2 = Preparation of the final exam.** **F** = any study, work or experimental activity, not included in the previous classification, to improve abilities in languages, computing, networking, or anything aimed at future career prospects and the choice of a profession with a direct knowledge of the chosen field via, e.g., stages..
NOTE: In the following SSD will stand for: Dydactic Sector, ie course category in the Italian classification	

The teaching of the LM is done entirely in English

First course Year STARTING in AY 2010/11

Nota: for every course the corresponding exam must be passed

Semester	Course	SSD	Course type	Total credits	Theory type credits	Lab or stage or skill credits	Lectures HOURS	Teacher
I	Mathematical methods for physicists	FIS/02	B2	**6**	6	0	48	Titarchuck L.
	Quantum mechanics	FIS/02	B2	**6**	6	0	48	Masina I.
	Advanced electromagnetism	FIS/01	B1	**6**	6	0	48	Piemontese L
II	Scattering theory	FIS/02	B2	**6**	6	0	48	Drago A.

For achieving the 60 CFUs (credits) required for the 1st year the 36 missing CFUs can be chosen between:
- basic courses from **Table B1**, up to **12 Credits**
- basic courses from **Table B3**, up to **12 Credits**
- basic courses from **Table C**, up to **12 Credits**
- free choice courses (**type D activities**), up to **12 Credits**

Second Course Year STARTING in AY 2011/12

Semester	Course	SSD	Activity type	Total credits	Theory type credits	Lab or stage or skill credits	Lectures HOURS	Teacher
I/II	**Activity type: F**		F	**3**				
	Preparation of thesis and Final test			**45**				

For achieving the 60 CFUs (credits) required for the 2nd year the 12 missing CFUs can be chosen between:

- basic courses from **Table B1**, up to **12 Credis**
- basic courses from **Table B3**, up to **12 Credits**
- basic courses from **Table C**, up to **12 Credits**
- free choice courses (**type D activities**), up to **12 Credits**

Table B1

Nota: for every course the corresponding exam must be passed

Semester	Course	SSD	Course type	Total credits	Theory type credits	Lab or stage or skill credits	Lectures HOURS	Teacher
I	Physics of complex systems and laboratory	FIS/01	B1	**6**	3	3	60	R. Tripiccione
II	Electron microscopy: Theory and applications	FIS/01	B1	**6**	3	3	60	To be defined
II	Biophysics	FIS/07	B1	**6**	6	0	48	M. Gambaccini
II	Measures and observation of celestial X-and Gamma- Rays	FIS/01	B1	**6**	3	3	60	F. Frontera
II	Relativity	FIS/01	B1	**6**	6	0	48	A. Dolgov
I/II	High energy physics laboratory	FIS/01	B1	**12**	6	6	120	Contract
II	Physics of Semiconductors laboratory	FIS/01	B1	**6**	3	3	60	V. Guidi

Table B3

Nota: for every course the corresponding exam must be passed

Semester	Course	SSD	Course type	Total credits	Theory type credits	Lab or stage or skill credits	Lectures HOURS	Teacher
II	Nuclear and Subnuclear AstroPhysics	FIS/04	B3	**6**	6	0	48	G. Fiorentini
II	Elements of Particle Physics	FIS/04	B3	**6**	6	0	48	D. Bettoni
II	Nuclear Physics	FIS/04	B3	**6**	6	0	48	A. Drago
II	Solid state Physics	FIS/03	B3	**6**	6	0	48	L. Giovannini
II	Magnetic Properties of Matter and Laboratory	FIS/03	B3	**6**	3	3	60	Contract

Table C

Nota: for every course the corresponding exam must be passed

Semester	Course	SSD	Course type	Total credits	Theory type credits	Lab or stage or skill credits	Lectures HOURS	Teacher
I	Sensors: Physics and Technology	FIS/01	C	**6**	6	0	48	C. Malagù
I/II	Field Theory (first and second part) • First part: same as *"Introduction To Field Theory"* LM Fisica 2nd year;	FIS/02	C	**12**	12	0	96	M. Moretti *- M. Moretti*

	• Second part: same as *"Applications Of Field Theory"*, LM Fisica 2nd year.							*- R. Tripiccione*
II	Surface Physics and nanostructures	FIS/03	C	**6**	6	0	48	F. Spizzo
I/II	Elementary Particle Physics (first and second part) • First part: same as *"Strong Interactions Phenomenology"* LM Fisica 2nd year; • Second part: same as "*Fenomenology of electroweak interactions*", LM Fisica 2nd year.	FIS/04	C	**12**	12	0	96	D. Bettoni *- D. Bettoni* *-C. Bozzi*
I	Modern Cosmology	FIS/05	C	**6**	6	0	48	A. Dolgov
I	High Energy Astrophysics	FIS/05	C	**6**	6	0	48	L. Titarchuck
II	Radioactive decay and dosimetry	FIS/07	C	**6**	6	0	48	M. Marziani
I	Biophysics Laboratory	FIS/07	C	**6**	3	3	60	G. Di Domenico

The student can get **12 type D CFUs (Free choice activities)** by making his/her choice from related courses given in the Faculty OR from courses in other disciplines considered in the LM school in Physics or from other courses in the Triennale (basic) or Magistrale Laurea in this University , as long as they are coherent with the educational goals of the Laurea Magistrale School: they ought to be approved by the CCS.

Free choice activities (Type D)

The choice of the "free" activities must be submitted to the CCS no later than **November 30**. The choice shall be made **on-line** from the student's web page, which can be accessed from the site: **http://studiare.unife.it.**
NOTE that it is not possible to choose only parts ("modules") of integrated multimodule courses (and exams). Students are also invited to choose courses taught in the Physics curriculum.
In the A.Y 2010-11 the CCS Magistrale in Fisica will provide also the following course:

Semester	Course	SSD	Act.	Credits	Type	Teacher
I	Physics of critical phenomenai	FIS/03	D	6	T	R. Zivieri

Related courses and activities: stage, skill, lab or other

The **3 credits of type F** for learning activities aimed at improving/acquiring further language skills, computing/networking capabilities and at preparation for a job via internships in Universities or stages in non-University organizations can be earned as explained in the following Table:

	Course / Activity	Foreign language, computing, job	*SSD*	*Credits Max*
F1	Advanced English	Foreign language	L/LIN 06	**3** per certified course
F2	Stages of professional training in firms or non-University Research Centers.	Job		**3**
F3	Internships in Italian or foreign labs or Research Centers connected to Universities.	Job		**3**
F4	Credits from courses on computing and networking skills (P. Ex. Advanced ECDL certification; or, advanced courses on computing).	Computing	INF/01	3 per certified course

The practical organization of stages and internships will be made by the CCS, who will also evaluate the credits earned, keeping in mind that a month of full time work is worth six credits.

The acknowledgement of activities F1 and F4 must be requested by the student at the Student Secretariat, and they all must be approved by the CCS as part of the student's curriculum.

	For activities of type F2 (always) and F3 (only for internships in Universities other than Ferrara) the student must prepare beforehand, together with the Didactic Manager, the plan of her/his activities. For each of these activities, when not made in the University of Ferrara, beside the official tutor of the student another tutor will be appointed, chosen between the members of the host Institution.

Course priorities	. No course in this program is preliminary to any other .
Course/exam priorities	No priorities in the exams.
Final exam	For admission to the final exam the student must have achieved **75** credits. Then the student takes up an independent activity of either scientific research or of review and critical analysis and overview on an advanced research subject, upgrading his competence and skills already acquired in the previous studies. The description of such work will be the subject of a Thesis to be discussed at the final exam. The choice of the subject and the writing of the thesis will be done with the collaboration and under the supervision of a tutor chosen by the student. The thesis should be written in English, when authorized by the CCS. In such case an abstract in Italian must be written and given to the Secretariat together with the Thesis. **The final exam**, evaluated **45 credits**, consists in the discussion of the thesis. The examination committee evaluates the candidates on the basis of the results obtained and presented in the thesis, and of the curriculum of studies. In the final exam a mark will be assigned; the maximum is "centodieci" (110), with the possibility in outstanding cases of a "cum laude" mark. The numeric value of the mark is computed by adding to the mean of the votes in the exams a grade, max. 8 points, for the thesis work, with the numeric result capped at 110. The addition "cum laude" can only assigned when the exams average is higher than 103 and by unanimous decision of the Commission.
P.I.L. / **Professional training**	Second year students and students late with their exams can join the Project "Percorsi di Inserimento Lavorativo" PIL (Route to a Work Integration). Its program provides for a period (October to December) of lectures followed by a selection and association (January) of candidates with available positions, followed by a stage in a firm (February to April) and a one-year work contract, paid normally. The learning associated with the PIL stage will be documented with a certificate; the whole activity shall be evaluated in terms of credits for the completion of the LM (Master).
Curricula with different lengths	Normally, the LM is achieved in **two years** and corresponds to the achievement of **120 credits**. The student however, while still having to complete all the activities listed in her/his curriculum can still obtain the LM by agreeing with the CDS on a curriculum of different duration. Two choices are possible: - a curriculum **longer than normal**, registering only to one semester or to single courses at a time, but still in the proper order. Any further changes to the study plan must, of course, be approved by the CDS. - a curriculum of **shorter duration** than normal (but still at least one year long), anticipating to the first year the stages, reasearch, internships normally in the second year (still, however, of value equivalent to one year) Such curriculum must be presented in detail to the CCS, who will evaluate the proposal and decide, approving it or agreeing with the student on modifications. In case the structure of courses is modified, while "longer duration" students are in the studying process, if the courses in the normal curriculum the students should take are no longer present, those students will complete the school with the courses in the new curriculum. The CCS will examine the past studies of the longer duration students and decide upon the further development and the acknowledgement of already gained credits. .
Recognition and acceptance of foreign degrees	The Recognition of a University degree (bachelor) obtained abroad – for admission to the LM - is decided by the CCS after examination of a request furnished with the list of exams passed and the relative programs. For any information of administrative nature please contact the "Ufficio Mobilità internazionale e studenti stranieri" (Office for foreign students and international mobility)– Via Savonarola, 9 – e-mail: mob_int@unife.it
Validation of passed	Any request of validation of exams must be submitted to the students Secretariat, in via

exams	Savonarola 9, no later than **November 30 2010,** in order to be passed on to the CCS.
Transfer of students from other Universities	In case of students from another laurea from Ferrara University, or of transfer from another University Italian or from the EU, the CCS will examine the previous University career, determine the further development if possible at all, and decide about recognition of already achieved credits after having established the equivalence or affinity of the courses.. The requested level in Physics for being accepted in the School is of course not modified by this procedure of course recognition. For each mandatory subject the obtained credits are recognized within the limit of the credits achieved with the equivalent course at Ferrara. The extra credits are recognized, on request, for optional courses and free choice activities**.**
Useful contacts and Web site for other informations	For other questions please contact: **Official web site:** http://www.unife.it/scienze/lm.physics **Official regulations**: http://www.unife.it/ateneo/organi-universitari/statuto-e-regolamenti/statuto-e-regolamenti

April 2010

Prof. Roberto Calabrese
Chair of the Consiglio del Corso di Studi (CCS)