



UNIVERSITÀ DEGLI STUDI DI ROMA
“Tor Vergata”

FACULTY OF ENGINEERING

SECOND LEVEL MASTER COURSE

in

“PHOTOVOLTAIC ENGINEERING”

Third edition

HEADMASTER: prof. Franco Giannini

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MASTER COURSE'S AIMS

The demand for renewable energy is steadily increased and in parallel with it the interest from the industrial system in it. Some of the renewable energy production systems have already reached market maturity, while others are still financially supported by public funds.

Due to an increasing demand, the photovoltaic industry has gained vigour; it attracts an increasing number of new workers and researchers and that increases the demand for specialized staff.

Therefore the aim of this Master Course is to answer to the request of the industrial and research sector by preparing profiles able to operate in the whole range of photovoltaic. This Master Course indeed pursues to form professional characters with abilities ranging from analysis, study and design of photovoltaic systems to management and maintenance of systems, professionals who are even able to work in public and private research sectors and to interact with managerial fields of the innovation area.

So this Master Course gives students appropriate technical, operative and cognitive instruments in order to allow them to take a leading role in the new industrial framework.

Moreover the Master Course intends to illustrate not only the aspects related to the traditional silicon photovoltaic but the aspects related to the organic photovoltaic of III generation, as well.

The proposed study plan is addressed both to the training of neo-graduates and the updating of technicians already operating in private companies and public administrations. For that reason, the proposed subjects belong to different scientific and technical areas (physics, chemical, engineering, economics, etc..) but



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each of them concurrent and fundamental for the training of the professional profile object of this Master Course.

An introductory section, for example, will lead the student in the geopolitical aspects connected with the energy market in general and with the photovoltaic one in particular. An optional module, instead, concerning aspects linked to the financing funding techniques and *project financing* ones, will be addressed to those who are interested in getting into the entrepreneurial world.

A particular interest is dedicated to the training in various laboratories (Polo Solare Organico, Regione Lazio, ENEA) where the acquired theoretical competences are checked through practical experiences, in this way the Master Course achieves, unlike others in that area, such a highly technological level.

The Master Course is addressed to the protagonist of the future within the new framework recommended by the EU.

The 8th and 9th March, 2007 Council of Europe indicated three main and binding aims to get by year 2020: 20% reduction of greenhouse gas emission, 20% production of energy through renewing sources and use of the 10% of self-traction energy from biofuel.

So it is stated that this Master Course comes well up to the new energy emergencies, offering an high level training carefully planned and particularly innovative in methods and contents.

EDUCATIONAL ACTIVITIES PROGRAMME

The Master Course has got an international nature and it is addressed to both italian and foreigner students.

The proposed plan of study is aimed both to the training of recent university graduates in technical-scientific subjects (a Second Cycle Degree – *Laurea Specialistica*; an italian undergraduate degree/ a 4 - year bachelor degree or other degree deemed equivalent by the Faculty Council this Master Course refers to) and to the updating of knowledge and skills of professional already operating in private business and public administrations within this field.

The Master Course training aimed at the following areas:

- Analysis, study and design of photovoltaic systems
- Technological support in those companies working in this sector
- Private and public research
- Management and maintenance of systems
- Interaction with managerial sectors working in the area of innovation

The subjects proposed belongs to different scientific and technical areas (physics, chemical, engineering, economics, etc..) but each of them is fundamental and concurs to the training of the professional character



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object of this Master Course. A full professional training will be given in the theoretical and practical aspects, starting from photovoltaic technologies, carrying on with topics related to the geopolitical strategy concerning the photovoltaic, to economic aspects and *project financing*. Our target is to create a professional able to move in the new energy sceneries to exploit all the new emerging opportunities associated to the green finance world. The photovoltaic technology is the most supported by funding based on working account. With regard to this an optional section will be dedicated to the Italian Conto Energia.

A particular attention will be dedicated to the training at laboratories where theoretical competences will be checked through suitable practical experiences.

TEACHERS AND TUTORS

The academic staff is composed of Tor Vergata professors, external professors and other academic staff from research centres boasting a long-term teaching experience in the academic area. Classes will also be given by professionals from the world of work with technological and financing competences related to green finance mechanisms.

Students will be even supported by qualified tutors able to give good assistance for every possible problem during the training course.

DIDACTIC METHODS

The partakers at the Master Course will follow their classes in a modern academic environment, a place open to receive the most significant boosts for achieving the fixed purposes, in an atmosphere of open competitiveness with the surrounding world.

Therefore classes, besides giving the technical bases of the photovoltaic, will keep a close relation with the evolution and the events of the external world and will be promptly updated, if it deems necessary, in order to constantly conjugate research with the industrial world of that sector.

The Master Course will last one, two or three academic year depending on the individual students' plan of study.

The didactic plan provides 60 credits, equal to 1500 hours, indicatively distributed in:

400 face-to-face hours

350 hours of operational work in laboratory supported by teachers and tutors

750 hours of individual study

The hours of operational work include stages in companies. Students shall have to carry out at least 320 hours of stage in 100 days. Days and hours will be fixed according to the companies' availability.



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Classes will be held in the afternoons to facilitate the attendance of workers, as well.

The 400 face-to-face hours are organized as follows:

Required Courses	Italian University Training Credit (CFU)	Face-to-face hours
Physics of photovoltaic	5	50 h
Chemical applied to photovoltaic	5	50 h
Electronic and Optoelectronic for photovoltaic	5	50 h
Conventional photovoltaic technologies	5	50 h
Innovative photovoltaic technologies	5	50 h
Design of photovoltaic systems	3	30 h
Balance of Plant	2	20 h
System of measurement, checking and certification	5	50 h
Geopolitics and strategies for photovoltaic	3	30 h
Economic e Project Financing of photovoltaic	2	20 h
Total	40	400 h.
Operational work in laboratory and stages	20	350 h.
Total	60	750 h.

The training activities will be carried out at the University of Roma Tor Vergata, at the Organic Solar Pole of Lazio - University of Roma “Tor Vergata” (CHOSE) and at the headquarters ENEA – Ente per le Nuove Tecnologie e l’Ambiente (New Technologies and Environment Institute). Study visits will be organized in already existing or in progress facilities as well as in photovoltaic cells and modules factories. These structures can then be ideal hosting places where the Master Course attendants will carry out their stages.

As regards practical exercises, they will be carried out in various laboratories, as:

- Organic Solar Pole of Lazio laboratory (CHOSE)- University of Roma “Tor Vergata”
- Environmental Technical Physics laboratory - University of Roma “Tor Vergata”
- Quantistic Electronic and Plasm laboratory - University of Roma “Tor Vergata”
- ENEA Photovoltaic laboratory, (Casaccia headquarter)
- ENEA Photovoltaic laboratory, (Portici headquarter)

Attendance is compulsory for at least 85% of classes and seminars, as well as the regular participation in practical activities at laboratories. Attendance will be checked by signature records.

If participants would not respect the fixed obligations, they will not be admitted to final certificate.



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ACHIEVEMENT CHECKING

The achievement of credits corresponding to the different activities depends on passing checking tests and final test to verify all the acquired competences.

A written and/or oral checking test is foreseen for the end of each required course and a final test consisting of an exposition (by form of public conference) of a technical report related to the candidate's activities performed within the operational activities.

Test marks are expressed in thirtieths (30/30) or full mark (30/30 *cum laude*), starting from 18/30 minimum. Instead, final test mark is expressed in hundred tenths (110/110) or full mark (110/110 *cum laude*), starting from 66/110 minimum.

The **final test** should be done within the examination sessions planned in the last academic year of the Master Course.

ADMISSION REQUIREMENTS

Applicants for this Master Course must satisfy the following study requirements:

- an Italian undergraduate degree (a 4 - year bachelor degree);
- a Second Cycle Degree – *Laurea Specialistica* (Italian Ministerial Decree n° 509 dated November 3rd, 1999) or *Laurea Magistrale* (Italian Ministerial Decree n° 270 dated October 22th, 2004);
- other degree deemed equivalent by the Faculty Council this Master Course refers to.

This Master Course is not strictly addressed to Engineering graduates.

Enrolment of foreign European or non-European Community students legally resident in Italy holding a regular residence permit for employment or study purposes, is admitted.

According to art. 8, paragraph 1 of the University Didactic Regulation, officially certified training and specialization activities (including teaching activities within Courses of Study), performed after achieving the study degree required by this call for applications, can be recognized by the Master Course Council. Credits useful to the Master Course completion will be assigned to such activities, reducing the formative charge of 20 credits at most.

FOREIGN STUDENTS

Qualifications should be attached to the Application Form, provided of the official translation in Italian language, legalization and declaration of value released by the Italian Diplomatic Representation in the country where the applicant achieved the title.



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Non-European Community citizens resident abroad should submit the Application Form through the competent Italian Diplomatic Representation who shall in turn send to the University the Application Form with qualifications, official translation in Italian language, legalization and declaration of value attached.

Irregular Application Forms should not be accepted.

PRE-ENROLMENT AND ENROLMENT

The Master Course applies selective entry, the maximum number of students that may be enrolled is 25. Selection will be carried out by comparative evaluation of *curricula vitae et studiorum*. A list of suitable candidates will be drawn up on the basis of that evaluation.

The Master Course will not be activated if the minimum number of 10 enrolled necessary for the master activation has not been reached.

The tuition fee is:

1. 4.000 € for the Master Course attended in one year
2. 4.500 € for the Master Course attended in two years
3. 5.000 € for the Master Course attended in three years

The enrolment fee includes the participation in every foreseen activities (theoretical and practical), didactic materials and accident insurance.

A first fee of 2.000,00 € plus a virtual revenue stamp of 14,62 € have to be paid upon enrolment.

The English translation of this call for applications is available on the institutional Master website.

Pre-enrolment Procedure: To submit the Application Form you have to:

1. Go to the website <http://www.uniroma2.it> (English Version) and select in order: “Students” – “Master Second Level” – “Photovoltaic Engineering” and download the Application Form in the section “Instruments”(attaches number).
The English translation of the Application Form is available at http://www.masterpv.org/eng/master_photovoltaic_engineering.html.
2. Fill the **Application Form by December 31st, 2009** and send it preferably by e-mail to info@masterpv.org or to the fax number 06/72597567, with copy of the *curriculum vitae et studiorum* attached.

The list of admitted students will be published on the Master Website by January 21st, 2010.



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Enrolment Procedure

The admitted students should **complete online enrolment by January 29th, 2010**, following this procedure:

- Go to the website <http://delphi.uniroma2.it> and select “VOGLIO IMMATRICOLARMI” (“I want to enrol”) and then select in order “Ho superato il test di accesso” (“I pass the admission test”), “Inizia la procedura di immatricolazione” (“Start with the enrolment procedure”), “Corsi di perfezionamento - Master” (“Specialization Courses – Master”), “Facoltà di Ingegneria” (“Faculty of Engineering”), “Desidero immatricolarmi ad un corso sottoposto a concorso/test” (“I want to enrol in a course with selection test”), after filling in the boxes with your personal data, select “Master in Ingegneria del Fotovoltaico” (“Photovoltaic Engineering Second Level Master Course”) (Course code: PIF).
- Fill the Registration Form providing all the data required.
- After completing the procedure, a code (CTRL) will be displayed. You absolutely have to make a note of it before printing the Registration Form and the payment bulletin. This code will eventually help you to solve problems that it could be occurred (Reprint and Registration Form Delete functions).
- Print the Registration Form and the payment bulletin of the first fee of 2.014,62 € (inclusive of a virtual revenue stamp of 14,62 €).
- Payment should be made at any Unicredit-Banca di Roma Agency, located on national territory.
- After payment you have to go to the website <http://delphi.uniroma2.it> and repeat the above-mentioned procedure and select “Convalida di pagamento” (“Payment validation”), by putting the codes CTRL and AUTH (these codes are provided by the Bank Agency).
- THIS ADDITIONAL PROCEDURE IS ABSOLUTELY NECESSARY, in order to validate your enrolment.
- You have to use just only the payment bulletin created during the online enrolment procedure. Any amount paid using other ways of payment should not apply for this enrolment.
- Deliver or send by recorded delivery with acknowledgment of receipt re the documentation (printed and filled Registration Form, bank payment receipt, copy of a valid identification document, enrolment receipt where it is written “da consegnare in segreteria” – “to deliver to the secretary”) to:

Università degli Studi di Roma “Tor Vergata”
Segreteria Corsi di Perfezionamento e Master universitari
Via Orazio Raimondo, 18
00173 Roma.

by and not beyond January 29th, 2010

- The second instalment of 2.000,00 € must be paid **by April 29th, 2010**, following the same procedure of the first fee payment, by connecting to the website <http://delphi.uniroma2.it> at the section ““Voglio iscrivermi agli anni successivi o accedere ad altri servizi” and putting the



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“matricola number” (“number of enrolment”) and the password provided during the enrolment procedure. After validation, the payment receipt should be sent to “Segreteria dei Corsi di Perfezionamento” by the established dates.

After each payment you have to validate it on line, otherwise it will not be possible to proceed to the next step.

The secretary’s office “Corsi di Perfezionamento e Master Universitari” is open on Monday, Wednesday and Friday from 9 a.m. to 12 a.m. and on Wednesday evenings also from 2 p.m. to 4 p.m. (tel. 06/72592003 - fax 06/72592223).

Each enrolled student has to send a copy of his filled study plan to info@masterpv.org by January 29th, 2010. Study plan can be downloaded from the website www.masterpv.org.

TITLE ACHIEVEMENT

Getting the Master Course degree depends on the achievement of the required 60 CFU (Italian University Training Credit) and on attendance check. Students should attend at least 85% of the classes.

At the end of the Master Course, an **University Second Level Master Degree in “Photovoltaic Engineering”** will be issued to those who regularly attended classes and passed checking and final tests.

The final exam will be held within the sessions fixed for the last academic year of the Master.

After getting the Master Degree students can ask for the parchment degree certificate by submitting a request with a payment bulletin receipt of 100,00 € (inclusive of virtual revenue stamp fee) attached (unless any change established by the Administrative Board of the University).

The payment bulletin is available on the website <http://www2.uniroma2.it> in the section “L’amministrazione” (“The Administration”), then, you can select “Ufficio Progettazione e Grafica Stampa Pergamene” (Print Parchment) and you can download and print the payment form in the section “allegati” (“attachments”).

The parchment request within the payment receipt should be delivered by hand or by recorded delivery with acknowledgment of receipt to:

Segreteria Corsi di Perfezionamento e Master universitari – Via Orazio Raimondo 18 – 00173 ROMA.

BENEFITS

Various economic benefits are activated for the most deserving students and in favour of those who have economical hardships, as:

- **Scholarship setting up.** The setting up of possible scholarships for covering the enrolment fee amount, totally or partially, depends on a list prepared on the bases of *curricula vitae* evaluation and an interview with the candidates who make request. In case of partial exemption from Master



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Course enrolment fee or in case of scholarships, the 20% of the whole tuition fee should be, however, paid for covering the University's general costs.

- Exemptions from Master Course enrolment fee and a reduced tuition fee of 100,00 € for the attendance of the whole Master Course are foreseen for students with a **civil disability of 66% or more**, proved by proper documentation. Students entitled have to provide all the documentation in original to the secretary's office, before the enrolment.

COORDINATING STRUCTURE

Scientific Secretary:

dr.ssa Carla Cenci

Department of Electronic Engineering,
University of Roma “Tor Vergata”

Address: Via del Politecnico, 1 - 00133 Roma

Telephone: 06 7259 7254

Fax: 06 7259 7567

E-mail: carla.cenci@uniroma2.it

Didactic service:

dr.ssa Carla Di Chiara

Department of Electronic Engineering,
University of Roma “Tor Vergata”

Address: Via del Politecnico, 1 - 00133 Roma

Telephone/Fax: 06 7259 7567

E-mail: info@masterpv.org

INFORMATION

For further information please visit the website www.masterpv.org.

HEADQUARTERS

University of Roma “Tor Vergata”

Department of Electronic Engineering

Address: Via del Politecnico, 1 - 00133 Roma

Roma, the 9th November, 2009

Il Direttore Amministrativo
dott. Ernesto Nicolai

Il Rettore
prof. Renato Lauro