



UNIVERSITÀ DEGLI STUDI DI ROMA
“Tor Vergata”

FACOLTA' DI INGEGNERIA

SECOND LEVEL MASTER COURSE

in

“PHOTOVOLTAIC ENGINEERING”
Second Edition

HEADMASTER: Prof. Franco Giannini

Academic Year 2008/2009

MASTER COURSE'S GOALS

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

Due to the increase in demand, the photovoltaic industry has regained vigor; it attracts an increasing number of new operators and researchers, it increases the demand for specialized staff.

The aim of this Master Course is to answer to the request of the industrial and research world, preparing profiles able to understand and operate on the whole range of photovoltaic.

This Master Course wants to form professional characters with abilities ranging from analysis, study and design of photovoltaic systems, to management and maintenance of systems, who are



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

even able to work in public and private sectors of research and to interact with managerial sectors of the innovation area.

So this Master Course therefore aims at giving students appropriate technical, operative and cognitive instruments in order to take a leading role in the new industrial framework.

The plan of studies is therefore addressed both to the training of the neograduates and the aimed updating technician already operating in private companies and public administrations. According to this point of view, the subjects proposed belongs to different scientific and technical areas (physics, chemical, engineering, economics, etc..) but each of them concurs and is fundamental for the training of the professional character object of this Master Course.

A particular interest is dedicated to the training in various laboratories (Polo Solare Organico, Regione Lazio, ENEA) where theoretical competences are checked through practical experiences correlated to photovoltaic.

In the Master Course will be faced not only those aspects relative to the traditional silicon photovoltaic but also the aspects relative to the organic photovoltaic of III generation.

An introductory section will lead the student in the geopolitical aspects connected with the industrial market in general and with the photovoltaic one in particular. An optional module, instead, will be addressed to those who are interested to get into the entrepreneurial world and will concern those aspects linked to the financial support techniques and project financing.

Our Master Course of second level for the engineering of photovoltaic wants to form the protagonist of the future, of the new scenery recommended by UE. The 8 and 9 March Council of Europe indicated the three main and binding aims to get within 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 .

WHY DO A MASTER COURSE IN “ENGINEERING OF PHOTOVOLTAIC”?

In the current phase of transition from an energy system principally based on oil and fossil fuel to an endurable energy system, the photovoltaic technology is considered the key technology for the great availability of the solar source.



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

The European industry connected with photovoltaic, in 2005, has grown up to 45% and the total amount of invested capital has been of 4,2 billion of Euro. Besides, the European Commission esteems show an annual growth of 26–32 % for the following 20 years.

In this way the photovoltaic turns out to be an excellent candidate to ensure the respect of European targets of 20% of renewing energy production, and 20% of CO₂ emissions, because it will involve a reduction of 730 CO₂ billion of tonne.

They consider that in 2020 the solar energy industry will have produced 2,25 million of jobs, even taking solar of III generation in account.

So, a Master Course about photovoltaic engineering comes well up to these new demands, offering an high level formation carefully planned and particularly innovative in methods and contents, ranging over all available technologies. This Master Course wants to form professional characters with abilities ranging from analysis, study and design of photovoltaic systems, to management and maintenance of systems, who are even able to work in public and private sectors of research and to interact with managerial sectors of the innovation area.

WHY TOR VERGATA?

“Tor Vergata” University of Rome is a leading University for photovoltaic. It is the headquarter of Organic Photovoltaic Pole of Lazio, CHOSE - Center for Hybrid and Organic Solar Energy.

The Pole was born in December 2006, for Lazio Region and Department of Electronic Engineering will to create, at the University campus of Tor Vergata, a centre of excellence for the development of research and industrialization of organic and organic-inorganic hybrid technologies applied to photovoltaic cells.

TO WHOM IT TURNS TO

The Master Course has got an international nature; it turns to both Italian and foreigner students and will be entirely carried out in English.

The Master Course wants to form a professional character useful both in industry and in the research sector of photovoltaic, either traditional or innovative.

Actually there isn't a specific training for the professional figure of *photovoltaic engineer* with specific competences in the field of conventional and innovative technological sectors. This compartment is fast developing and professional characters with those quality are currently looked for in the market.

The study plan is aimed both to the training of young graduates in technical-scientific subjects (Second Cycle Degree, Former Italian System University Degree – *Laurea* -, other titles identified



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

as equivalent to a Second Cycle Degree by the Master Course Faculty Council), and to the updating of knowledge and skills of professional already operating in private business and public administrations within this field.

PROGRAM AND PURPOSES

The Master Course wants to form professional characters with competences in the following sectors:

- 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 sector working in the area of research

Thus this Master Course wants to give students appropriate technical, operative and cognitive instruments to gain the leading role in the new industrial framework.

The subjects proposed belongs to different scientific and technical areas (physics, chemical, engineering, economics, etc..) but each of them concurs and is fundamental for the training of the professional character object of this Master Course. A full professional training will be given in the theoretical and practical aspects, starting from photovoltaic technologies to strategy and geopolitics linked to photovoltaic, as far as economics and Project Financing.

Besides, a particular attention will be dedicated to the preparation at laboratories where theoretical competences are verified through practical experiences linked to photovoltaic.

Our target is to create a professional able to move in the new energy sceneries to exploit all the new opportunities associated to the green finance world. In this sphere the photovoltaic technology is the most supported of all by funding based on accounting year. At this regard an optional section will be dedicated to the Italian Conto Energia.

TEACHERS AND TUTORS

The academic staff is composed of Tor Vergata professors, external professors and other academic staff from research centers boasting of teaching experience in a university environment. Lessons will also be given by professionals in the field of technology or in the field of “green finance”.

Students will be even supported by tutors, that is qualified persons in a position to give valid assistance for every possible problem during the formative course.

DIDACTIC METHODS



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

The partakers at the Master Course will follow their lessons in a modern academic environment where all the new stimulus from the outside are collected in an atmosphere of open competitiveness with the surrounding world.

Therefore lessons, apart from giving the technical bases of the photovoltaic, will be contextualized in the external world and then promptly updated to conjugate research and industrial world.

The course time is one, two or three academic year depending on each student's choice. The formative activity provides 60 credits, equal to 1500 hours indicatively distributed in:

- 400 frontal hours
- 350 hours of operative work in laboratory supported by teachers and tutors
- 750 hours of individual study

The lessons will be in the afternoons to facilitate the frequency also by workers.

The 400 frontal hours are organized as follow:

Teaching	CFU	Frontal 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
operative work in laboratory assisted by teachers or tutor	20	350
Total	60	750

Lessons will be carried out on the Roma Tor Vergata premises, in the Latium Organic Solar Pole – *Università di Roma “Tor Vergata” (CHOSE)*, and in the headquarters ENEA – Ente per le Nuove Tecnologie e l’Ambiente (New Technologies and Environment Institute). Study visit will be organized in already existing / in construction production facilities as well as in photovoltaic cells and modules factories. These facilities can then be ideal hosting structure for the Master Course internships.



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

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

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

Attendance is obligatory for at least 85% of lessons and seminars, and so for constant participation to practical activities at laboratories. Attendance will be checked by signature on presence register. If participants would avoid fixed obligations, they will not be admitted to final certificate.

ACHIEVEMENT CHECKING

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

A written/oral checking test is provided for at the end of each teaching and a final test consisting of an exposition, by form of public conference, of a technical elaborate the candidate has worked on to, during operative activities.

Test votes are expressed in thirtieths with eventual praise, starting from 18/30 minimum. Instead, final test vote is expressed in hundred tenths with eventual praise, starting from 66/110 minimum.

The **final test** should be done until the academic year.

ADMITTANCE QUALIFICATION

To be admitted, a Second Cycle Degree Former Italian System University Degree – Laurea -, other titles identified as equivalent to a Second Cycle Degree by the Master Faculty Council, is applied for.

This Master Course is not strictly addressed to Engineering graduates.

Inscription of foreign Community and extra-community students resident in Italy with regular residence permit for study or work reasons, is admitted.

The Master Course has restricted enrollment and 25 candidates maximum are admitted. Participant selection will be carried out by comparative evaluation of c.v., on the basis of a list will be settled.

According to art. 8, comma 1 of the Academic didactic Regulation, the Master Course council can admit formative and further training activities successive to the qualification useful to enter the Master Course and of whom there is a official documentation (included teaching activated in the sphere of study), on condition that are coherent with the Master Course characteristics. To these activities will be assigned credits useful to ultimate the Master Course, reducing the formative charge of 20 credits at most.



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

FOREIGN STUDENTS

The qualification should be attached to the inscription question, equipped with the translation in Italian language, the legalization and the declare of value by the Italian Diplomatic Representation in the place in which the qualification was obtained.

The Extra community students who live in a foreign country, will make application through the Italian Diplomatic Representation of their country, who will send the question to the University, attaching the foreign qualification equipped with the translation in Italian language, the legalization and the declare of value.

The irregular question will not be count.

PARTICIPANTS

Max 25 students

DURATION

The course time is one, two or three academic year depending on each student's choice. The formative activity provides 60 credits, equal to 1500 hours.

PRE – REGISTRATION AND REGISTRATION

The tuition fee to the Master Course is:

1. 4,000 € if The Master Course is finished in one year
2. 4,500 € if The Master Course is finished in two years
3. 5,000 € if The Master Course is finished in three years

The fees must be paid in two installments.

The first installment consist of 2,000 € and 14,62 € for the revenue stamp (virtually paid).

The fee includes the participation to all the theoretical and practical forecast activities, the didactic material and an accident insurance.

Pre – Registration Mode:

To make application for the Pre – Registration you have to:

1. Go to the website <http://www.uniroma2.it> and select in order: “Offerta formativa” – “Post Laurea” – “Master di II Livello” (II Level Master Course) – “Master in Ingegneria del Fotovoltaico” (Master Course in Photovoltaic Engineering) and download the appropriate form in the section “allegati al contenuto”.
2. Compile the pre registration form until 31 December 2008. Deliver the signed pre registration form and send it preferably by email (info@masterpv.org) or by fax (06/72597939).



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

The admittance ranking will be published on the website until 21 January 2009.

Registration Mode:

The candidates who will be admitted should complete their inscription by web (www.uniroma2.it) until 31 January 2009 following this modality:

1. Go to the website <http://delphi.uniroma2.it> and select “VOGLIO ISCRIVERMI PER LA PRIMA VOLTA” (I want to enter for the first time) and then select in order “Ho superato il test di accesso” (I have passed the admittance test), “Inizia la procedura di immatricolazione” (The registration mode will start), “Corsi di perfezionamento – Master Course” (Improvement Course – Master Course), “Facoltà di Ingegneria” (Engineering Faculty), “Master in Ingegneria del Fotovoltaico” (codice corso:PIF).
2. Compile the registration form in every details.
3. When you finish the compilation, you will obtain a code named CTRL and you must absolutely make a note of it before printing the registration form and the payment bulletin. This code will help you to solve any problem that it could be happen (reprint and annulment of your registration).
4. Print the registration form and the payment bulletin of the first installment (2.014,62 €, including the revenue stamp virtually paid).
5. The payment should be done at any Italian Agency of Banca di Roma.
6. Go to the website <http://delphi.uniroma2.it> and make the same route that you have done earlier and select “Convalida Pagamento” (payment validation) and insert the CTRL and AUTH codes (the bank will give you this codes).
7. THIS MODALITY IS ABSOLUTELY NECESSARY, for ultimate the registration.
8. You have to use *just only* the payment bulletin created at the moment of the registration.
9. Deliver or send the documentation (the printed registration form, bank payment receipt, a photocopy of a valid identification document, the matriculation receipt where appears “da consegnare in segreteria”) by a registered letter within and not beyond 31 January 2009 to:
Università degli Studi di Roma “Tor Vergata”
Segreteria Corsi di Perfezionamento e Master universitari
Via Orazio Raimondo, 18
00173 Roma
10. The second installment of 2.000 € must be paid until **30 April 2009**, following the same route of the first installment, connecting to the website <http://delphi.uniroma2.it> at the section “IMMATRICOLAZIONI ed ISCRIZIONI On Line” (Voglio iscrivermi agli anni successivi o accedere ad altri servizi). You have to insert the “matricola” number and the password that you have obtained with the matriculation. After the validation, the payment receipt should be sent to the Segreteria dei Corsi di Perfezionamento until the established date.
11. After every payment you have to validate your payment on line, otherwise it will not be possible to proceed to the next step.



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

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 also from 2 p.m. to 4 p.m. (tel. 06/72592003 – fax 06/72592223).

Each student have to send a copy of their syllabus until 31 January 2009 by email (info@masterpv.org). The syllabus can be downloaded from the website www.masterpv.org.

TITLE ACHIEVEMENT

The formative activities of the Master Course are of 60 formative credits. The title achievement depends on required frequency check. Attendance is obligatory for at least 85% of lessons.

At the end of the Master Course, to those who have attended how requested and have passed the checking tests and the final test, an **Academic Master Degree of II level in “Photovoltaic Engineering”** is issued.

At the end of the Master Course, it is possible to collect the parchment compiling a payment bulletin of 100,00 €, including the revenue stamp.

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 print the payment form from the section “allegati”.

The request to collect the parchment and the payment receipt should be delivered by hand or sent by a registered letter with return receipt to:

Segreteria Corsi di Perfezionamento e Master universitari – Via Orazio Raimondo 18 – 000173 ROMA.

SPECIAL TERMS

Various economics benefits are activated for the worthiest and in favor of those who have economical hardships, as:

- Scholarship setting up. The setting up of possible scholarships for covering all the costs of the inscription quota, depends on a list prepared on the bases of c.v. valuation and a conversation with the candidates who make a request. In case of partial exemption from inscription quota and scholarship, the 20% of the whole inscription contribute in favor of the Academy budget, should be however paid,
- Those who, from a suitable certification, turn to be in a handicap situation, with a disability of 66% or more, have an exemption from the inscription contribution and only 100 € to pay for the whole course.



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

INFORMATION

For information turn to www.masterpv.org or to
Francesca Buccarello:
Dipartimento di Ingegneria Elettronica,
Università di Roma Tor Vergata
via del Politecnico 1,
00133 Roma
Telefono: 06/72597784
Fax: 06/72597939
Email: info@masterpv.org

HEADQUARTER

Università di Roma Tor Vergata
Dipartimento di Ingegneria Elettronica,
via del Politecnico 1
00133 Roma

HOW TO GET THE FACULTY

By car

- Coming from ROMA-NAPOLI highway:
at TORRENOVA exit, turn to the traffic light on the left and go along Passolombardo St. and follow road signs to Engineering Faculty.
- Coming from **G.R.A.**:
Inside roadway: come out Roma-Napoli highway and on the slip road turn right in direction Romanina; go past **G.R.A.** and take Standford. St.; follow road signs to Sorbona St., go along this street to the first roundabout; turn left on Politecnico St.
Outside roadway: take Romanina exit, go past **G.R.A.** and take Standford. St.; follow road signs to Sorbona St., go along this street to the first roundabout; turn left on Politecnico St.

By public transport

- **From Leonardo da Vinci Airport – Fiumicino**



UNIVERSITÀ DEGLI STUDI DI ROMA “Tor Vergata”

Get on Roma-Fiumicino train, at the airport, and get off at Termini Station; take underground route A in direction Anagnina and get off at Anagnina stop (terminus). Take bus 20 express and get off at the second stop in Cambridge St.

- **From Ciampino airport**

Take shuttle bus to the terminus. The bus goes directly to underground A (Anagnina) terminus. Take bus 20 express and get off at the second stop in Cambridge St.

- **From Stazione Termini**

Take underground route A in direction Anagnina and get off at Anagnina stop (terminus). Take bus 20 express and get off at the second stop in Cambridge St.