



Università  
di Catania



# Second Level Master in Power Electronics Devices and Technologies



**HEAD OF MASTER PROGRAM**

**Prof. Mario Cacciato**

Department of Electrical, Electronic and Computer  
Engineering (DIEEI) Università di Catania

# Second Level Master in Power Electronics Devices and Technologies

## OBJECTIVE

**ACADEMIC  
CREDITS**  
**60 CFU**

**NUMBER OF  
ADMISSIONS:**  
Max. 30 students

**DEADLINE FOR  
SUBMISSION OF  
APPLICATION:**  
September 26, 2023

**HEAD OF MASTER  
PROGRAM**

**Prof. Mario Cacciato**  
Department of Electrical,  
Electronic and Computer  
Engineering (DIEEI)–Università  
di Catania

The objective of this academic program is to develop talents able to operate in high-tech industrial manufacturing processes. Competences will include materials and technologies, processing systems, design, production, and testing of power electronics devices at the heart of energy applications like automotive, renewable energy, and energy storage.

The University of Catania has entrusted the teaching of several modules to experts from STMicroelectronics, including mentoring for the internships and visits to relevant company departments and research laboratories.

Experts from other major international companies will also be invited to deliver seminars.



## FINAL ASSESSMENT

The final assessment consists of an oral presentation of a project drafted by the candidate on a specific topic studied during the program and/or during the internship period, following verification of compliance with attendance requirements.

The assessment committee nominated by the Master's Scientific Council will evaluate the project and the presentation with a mark expressed on a 110-point scale.

The assessment results in combination with the final examination will determine the final grade.

## SCHOLARSHIPS

A scholarship will be granted to the first 10 applicants ranked on evaluation criteria. Applicants ranked 11th to 20th will receive a grant for tuition fees.



## AIM AND SCOPE

Sustainable development is a must for modern societies, as declared in the 17 sustainable development goals of the Agenda 2030. Regarding energy, the transition to renewable energy sources must be implemented together with the adoption of energy efficiency techniques. From energy generation to consumption and transport, power electronics is considered the enabling technology for this transition, as it allows the conversion of electrical energy with high flexibility and performance.

Power electronics devices made with semiconductors are central to converters addressing a wide variety of systems ranging from a few milliwatts to gigawatts power.

Furthermore, a new class of devices based on wide-bandgap (WBG) materials has been recently introduced.

Thanks to these devices, power converters are more efficient, more compact and respond faster to all types of transients.

**The main objective of the Master in Power Electronics Devices and Technologies is the development of skills and advanced knowledge on solving multidisciplinary problems related to physics, chemistry and engineering, based on the research, development, production and testing of WBG power electronics devices. The program also focuses on the analysis, design and application of WBG devices in electronic systems and converters in modern applications like electric traction and renewable energy.**

## REQUIREMENTS

The program is open to all applicants, including early career professionals, with a master's degree ("Laurea Magistrale", Master of science, 4-year or 5-year degree) awarded in the last 5 years, in:

Physics (LM17), Electrical engineering (LM28), Electronic engineering (LM29), Automation engineering (LM25), Chemistry (LM54), Computer engineering (LM32), Telecommunication engineering (LM27), Mechanical engineering (LM33), Chemical engineering (LM22), Material science and engineering (LM53), and Industrial chemistry science and technologies (LM71).

**Excellent knowledge of English is required.**

## SCIENTIFIC COUNCIL

### Università di Catania

- Prof. Mario Cacciato  
Department of Electrical Electronic and Computer Engineering
- Prof. Giuseppe Compagnini  
Department of Chemistry
- Prof. Guglielmo Guido Condorelli  
Department of Chemistry
- Prof. Salvatore Mirabella  
Department of Physics and Astronomy
- Prof. Salvatore Pennisi  
Department of Electrical Electronic and Computer Engineering
- Prof. Antonio Terrasi  
Department of Physics and Astronomy

### STMicroelectronics

- Giuseppe Arena
- Michele Calabretta
- Gianfranco Di Marco
- Vincenzo Randazzo
- Mario Saggio
- Rosario Scollo
- Filippo Scrimizzi

### ABOUT UNIVERSITÀ DI CATANIA

Founded in 1434, with an average enrolment of 38,000 students, the Università di Catania is one of the oldest universities in Italy. Thanks to synergies and specific collaborations with several research institutes operating in its territory, the University offers a wide choice of excellence programs focused on research and didactic activities.

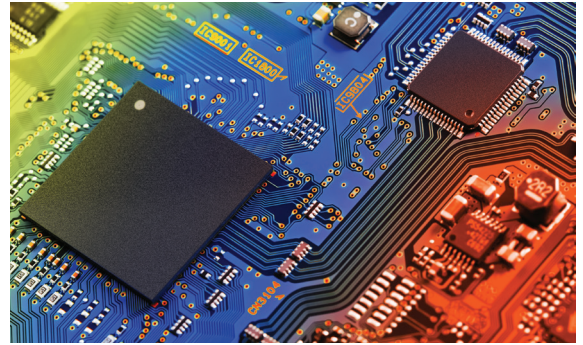
At ST, we are more than 50,000 creators and makers of semiconductor technologies mastering the semiconductor supply chain with state-of-the-art manufacturing facilities. An integrated device manufacturer, we work with more than 200,000 customers and thousands of partners to design and build products, solutions, and ecosystems that address their challenges and opportunities, and the need to support a more sustainable world. Our technologies enable smarter mobility, more efficient power and energy management, and the wide-scale deployment of the Internet of Things and connectivity. ST is committed to becoming carbon neutral by 2027. Further information can be found at [www.st.com](http://www.st.com).

## WHY APPLY

Graduates of this program will develop a technical profile with advanced knowledge on power electronics, and the ability to study materials, learn technologies, and understand manufacturing processes, as well as to design electronic converters with discrete components and systems-on-chip.

Lessons will be held both by university professors and by experts from local and international industrial sectors.

A final internship held at the STMicroelectronics site and the elaboration of a final project work will complete the course.



## EDUCATIONAL PROGRAM

The program consists of 16 modules:

- Physics of semiconductors: energy bands and electrical properties
- Physics of semiconductors: optical properties and wide band gap materials
- Crystal growth, thin film deposition, and processing
- Surface and interface analysis
- Structural characterization and microscopy
- Circuit theory for microelectronics
- Analog IC design
- Digital IC design
- Digital instrumentation
- Measurement uncertainty
- AC/DC and DC/DC converters
- Inverter topologies and applications
- Design of integrated circuits for energy management
- Design of discrete power converters
- Device physics
- Thermal behavior and reliability of power devices



## CAREER PATHS

Graduates can pursue their career in semiconductor manufacturing, power electronics systems, and relative applications.



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