



UNIVERSITÀ  
degli STUDI  
di CATANIA

DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE  
Master's Degree in Chemical Engineering for Industrial  
Sustainability

Academic Year 2021/2022 - 1° Year

---

# SUSTAINABLE ENERGY SYSTEMS

ING-IND/11 - 6 CFU - 1° Semester

## Teaching Staff

### FRANCESCO NOCERA

**Email:** fnocera@unict.it

**Office:** Caserma Abela

**Phone:** +39 0931 489431

**Office Hours:** Lunedì 8:00- 9:00

---

## LEARNING OBJECTIVES

*Provide students with basic knowledge of sustainable energy conversion technologies for industry and their environmental impact. At the end of the course, the students can apply their knowledge and understanding, and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study; They will have the ability to integrate knowledge and handle complexity and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments; They will be able to communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously; They will have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.*

If the lectures are given in a mixed-mode or remote way, some necessary variations may be introduced in order to comply with the program reported in the syllabus.

## COURSE STRUCTURE

*Energy engineering systems for industrial processes.*

*Energy efficiency and environmental impact.*

*Combustion processes*

*Measurement and assessment of pollutant emissions.*

*Mitigation technologies.*

*Environmental laws and policy .*

---

## **DETAILED COURSE CONTENT**

1. First Law & Applications
2. Ideal Gas and Adiabatic equation
3. Second Law
4. State Diagrams
5. Combustion
6. Boilers
7. Steam Power Plants
8. Gas Power Plants
9. Internal Combustion Engines
10. Reversed Cycles
11. Cryogenic Cycles
12. Heat Pumps
13. Environmental Impact of Energy Systems
14. Heat Transfer
15. Heat exchangers
16. Advanced Energy Systems
17. Cogeneration

---

## **TEXTBOOK INFORMATION**

1. Lecture notes: Sustainable Energy Systems
  2. Mehmet Kanoglu, Yunus A. Cengel Fundamentals And Applications Of Renewable Energy Macgraw hill 2019
  3. Yunus A. Cengel, Michael A. Boles Thermodynamics: An Engineering Approach, Macgraw hill 2019
  4. Dincer-Zamfirescu: Sustainable Energy Systems and applications. Springer 2011
  5. Kanoglu- Cengel-Dincer: Efficiency evaluation of Energy Systems, Springer 2012
  6. Alireza Bahadori: Pollution Control in Oil, Gas aand chemical Plants : Springer Verlag 2014
-