

Anno Accademico 2017/2018

INTRODUCTION TO POWER SYSTEMS AND ELECTRICAL MACHINES

Enrollment year

2017/2018

Academic year

2017/2018

Regulations

DM270

Academic discipline

Department

DEPARTMENT OF ELECTRICAL, COMPUTER AND BIOMEDICAL ENGINEERING

Course

INDUSTRIAL ENGINEERING

Curriculum

PERCORSO COMUNE

Year of study

1°

Period

2nd semester (05/03/2018 - 15/06/2018)

ECTS

12

Lesson hours

104 lesson hours

Language

Italian

Activity type

WRITTEN AND ORAL TEST

Teacher

BENZI FRANCESCO (titolare) - 6 ECTS MONTAGNA MARIO - 6 ECTS

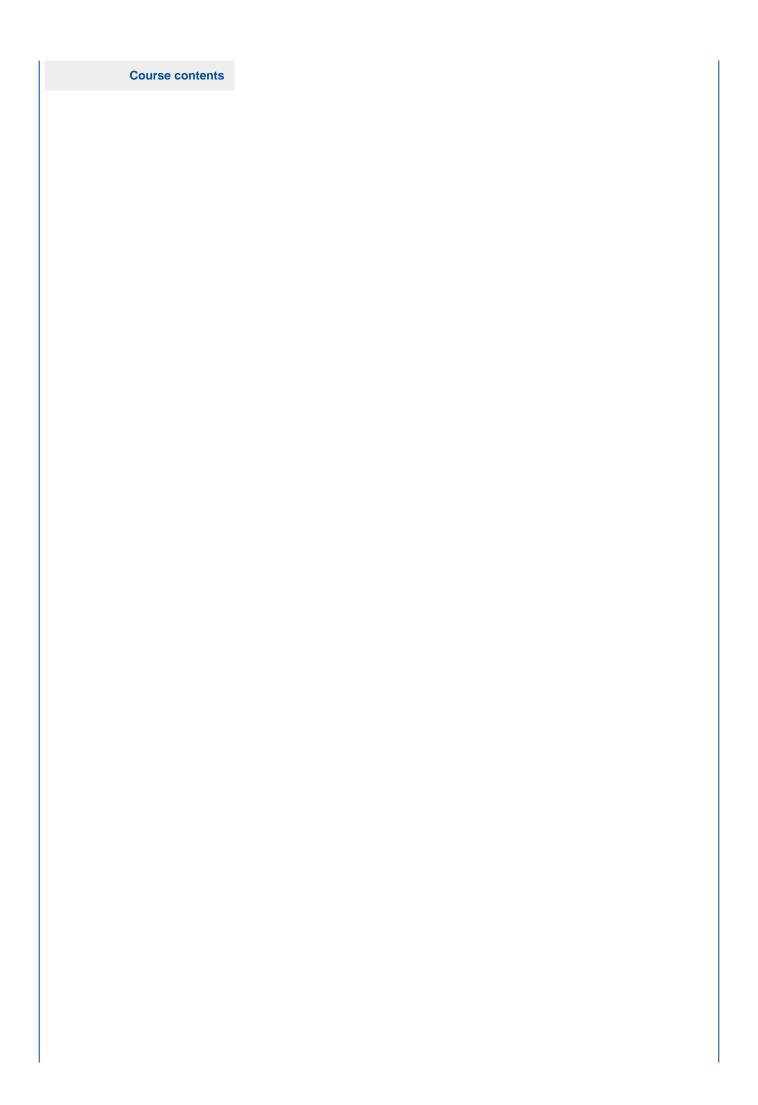
Prerequisites

Basics of Electrotechnics and Circuit Theory.

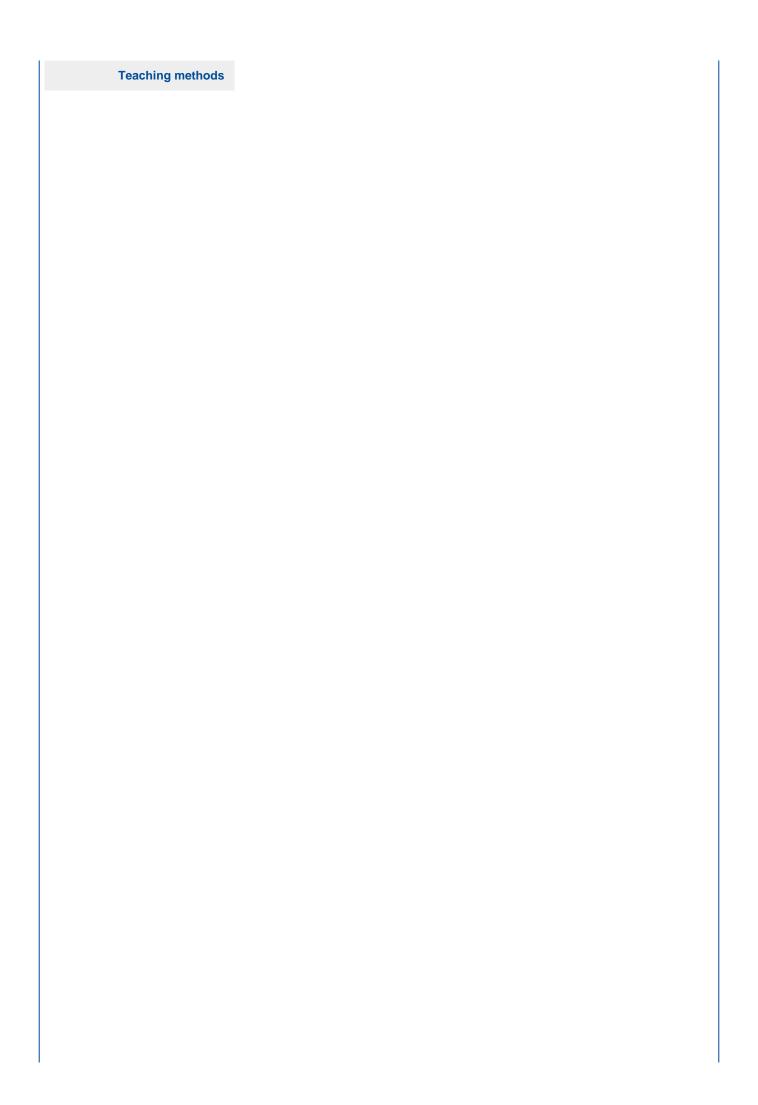
Learning outcomes

The course is intended to provide the basic elements of electrical systems, transformer and machines in industry and power systems. As for electrical systems the course will teach basic techniques for the analysis and design of electrical distribution and user systems, and in particular: lines sizing (both overhead lines and cables) at medium and low voltage; Protection against overload and short circuit.

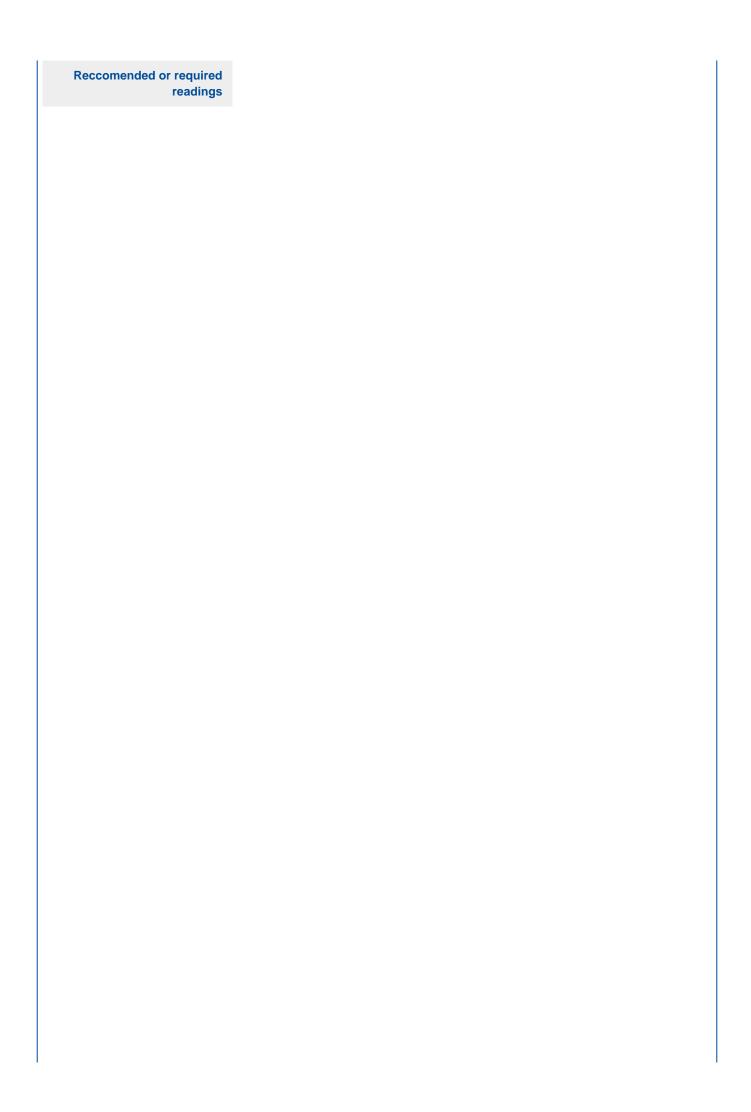
As for the electrical machines an introduction to thermal features and service types according to international regulation is provided. Role and use of transformers and industrial electric motors. For both the student will learn elementary knowledge of their principles of operation and their sizing with respect to given electrical or mechanical loads.



- Medium and low voltage distribution systems; network structure; electrical calculation of lines; approximate formulas of voltage drop for short lines; project and verification calculations according to the maximum voltage drop criterion.
- Thermal phenomena in electrical lines; heat transfer equations; current flow rate of overhead lines; Conduction capacity of cables; line sizing according to the thermal criterion; classification and structure of electric cables; low-voltage cables in air-laying or in underground installation according to CEI-UNEL standards; overload and short circuit behavoiur.
- Switching apparatuses; characteristics of switches, disconnectors and contactors, circuit breakers and differential switches.
- Low-voltage circuit protection; overcurrent protection; thermal relay; magnetic relay; magnetothermal protection; fuses. Protection against overloads and short circuits.
- Electrical machines for industrial applications. Role and characteristics of electrical machines in industry and power systems. Materials, losses in the materials, thermal problems. Service types and rated value definition.
- Power transformers. Transformer operating principle. Ideal and real transformer. Three-phase transformers. Transformer equivalent circuit. Transformer efficiency.
- The asynchronous machine. The rotating magnetic field. Induction machine operating principle. Engine operation. Equivalent circuit of the asynchronous machine. Torque and current characteristics. Starting techniques. Single-phase asynchronous machine.
- Speed control. Operation at variable frequency. Speed and torque regulation.



wo thirds of the course ae teached as lectures; one third is about umerical modelling and exercise.

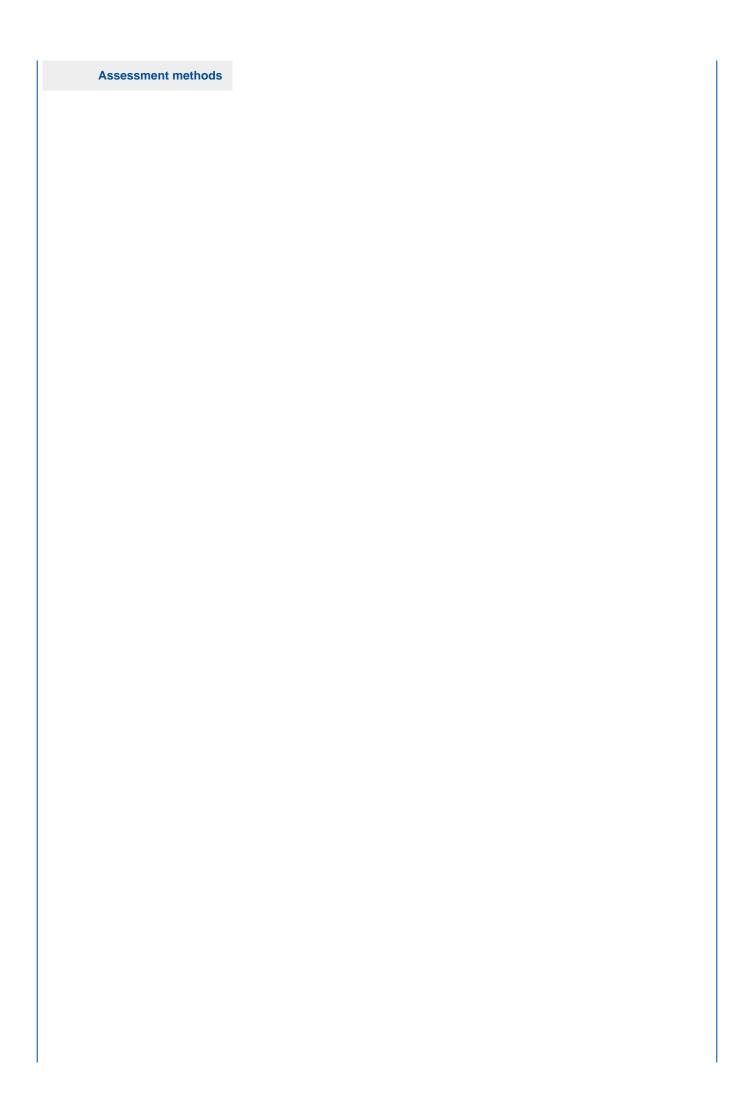


The lectures notes are made available to the students through the Kiro platform. Also a number of numerical resolved exercise are available.

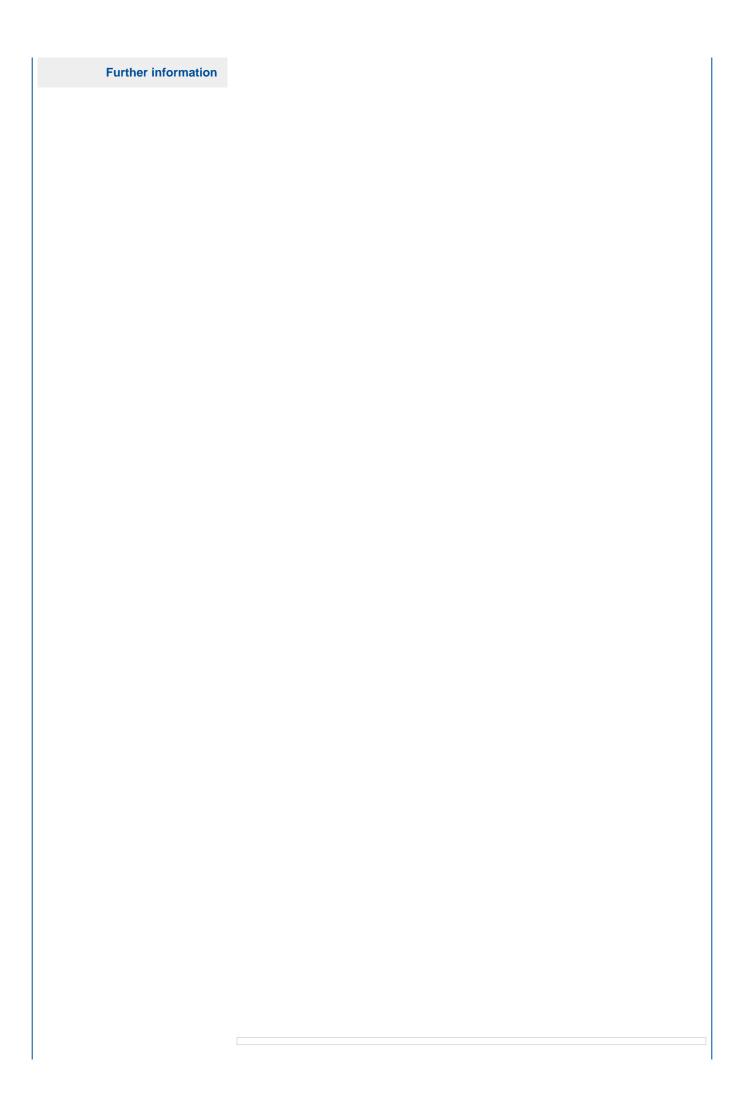
G. P. Granelli. Dispense di Impianti Elettrici.

G.P. Granelli, M. Montagna. Fondamenti di Impianti Elettrici vol. I. Cisalpino - Istituto Editoriale Universitario.

Comitato Elettrotecnico Italiano. Norme CEI 64-8 e CEI-UNEL.



The exam is written, and consists of a reasoned numerical resolution of one or more problems. It is possible to have an oral integration at the student's request.



Sustainable development goals - Agenda 2030

\$lbl legenda sviluppo sostenibile