Industrial Equipment and Services

Calendar: 6th semester

Contact Hours: T - 22,5; PL - 22,5; OT – 7,5

Scientific Area: Engenharia Química Industrial

Learning outcomes of the curricular unit
The competence acquisition by the student can be measured on the basis of the following objectives:
To apply generic concepts about the equipment's selection;
To differentiate with some detail equipments and industrial services essentials for the functioning of the chemical industries;
To know how to produce, use and distribute water steam in a factory;
To select the most appropriate way to use and produce electrical current

Syllabus
1. Equipment Selection: Selection of materials of construction of the equipment. Cost Factors, Selection of equipment for several operational units taking into consideration the cost factors (residence time and energy unitary)
2. Fuels – Natural and Forced Draft: Fossil fuels. Fossil fuels caraterization. Combustion. Natural draft: chimneys sizing. Forced Draft: Fans, characteristic curve, fans laws.
3. Production and use of Steam: Steam Generators. Rankine cycles, principles of use, components and applications of steam generators. Boilers.
4. Water Treatment: water treatment for use in steam generators. Degradation processes and types of water treatment.
5. Turbines: impulse and reaction turbines

Demonstration of the syllabus coherence with the curricular unit's objectives
The main objective of the curricular unit is to know differentiate with some detail the equipment and industrial services essential to the operation of the chemical industries. To do this in chapter 1 where will be lectured concepts of equipment selection, emphasizing on the choice of the type of equipment suitable for each unitary operation, as well as the material used for their conception. In chapter 2 are lectured concepts of fossil fuels, its combustion and use in industry and what equipment's are for the use for energy production.
In chapters 4 and 5 will be given emphasis to steam production and its use. In this chapter, is given importance to thermodynamic factors in steam production, use of steam for heating and energy production, as well as the treatment of water used for the production of steam. Finally, concepts of production and use of electric current, will be lectured with description of the equipment's used for that purpose.

Teaching methodologies (including evaluation):
Lecture or applied theory classes will be administered, using a lecture-based approach, using for that purpose slide or overhead projector presentations. The classes will be planning with the aim to stimulate interest, reasoning and critical spirit of the students. In the applied theory classes the students will autonomous resolve the exercises.
a) Continuous – 2 tests with 1h30 min duration each with minimum of 9.5 values (on 0 to 20 values scale) and 50%
b) By exam – Final examination with a minimum of 9.5 values (0 to 20 values) and 100% weight in the final evaluation.

Demonstration of the coherence between the teaching methodologies and the learning outcomes.
The main goal of this curricular unit is to allow the student to differentiate with some detail the equipment and industrial services essential to the operation of the chemical industries
For these contents to be correctly acquired by the students, it must be teaches in a solid and consistent approach. For that purpose it is necessary that basic concepts, be properly explained. Consequently, it is essential that in theoretical classes' the fundamental concepts are exposed.
The acquired knowledge can be consolidate by solving practical problems, either by the teacher or by the student, which is a very important reason for the presence of significant number of practical classes.