



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ENVIRONMENTAL ENGINEERING
SANITARY ENGINEERING PROGRAM

SA526 – SANITARY MACHINE AND EQUIPMENT

I. GENERAL INFORMATION

CODE	: SA526 Sanitary Machine and Equipment
SEMESTER	: 9
CREDITS	: 3
HOURS PER WEEK	: 5 (Theory, Practice)
PREREQUISITES	: HH223 Fluid Mechanics I
CONDITION	: Mandatory

II. COURSE DESCRIPTION

The course prepares students for the analysis and integration of the different machines, equipment, instruments, sensors, and piping that configure a hydraulic system, either a water supply system, a drainage system or another fluid transport system commonly used in sanitary engineering. Students calculate design specifications and select the most adequate machine, equipment or instruments that satisfy requirements. Students also analyze the criteria for the proper operation and maintenance of fluid transport systems, water purification, water softening and related systems. At the end of the course, students present and defend a design report.

III. COURSE OUTCOMES

At the end of the course, students:

1. Identify the components of a pumping system, specify and select them for properly fitting to the particular application.
2. Design piping systems including valves and accessories specifications and selection.
3. Specify and select softening water systems considering water requirements and demand.
4. Properly select meters for measuring the different variables of a water supply system.
5. Specify and select chlorination systems considering water requirements and demand.
6. Select and integrate the components of a water supply or a water removal system taking into account safety and quality norms and regulations.

IV. LEARNING UNITS

1. PIPING AND ACCESSORIES

Pipes and accessories characteristics and classification. Technical specifications. Technical norms. Fabrication materials. Dimensioning. Working pressure. Union types. Valves: types, technical specifications, technical norms. Globe valves. Step valves. Gate valves. Floating valves. Butterfly valves. Reduction valves.

2. PUMPS

Functioning principles. Parts and components. Types. Centrifugal pump: functioning, curves, specification and selection. Regenerative turbine. Deep well pump: specification and selection. Pumps operation and maintenance.

Hydro-pneumatic systems. Functioning principles. Pressure tank. Tank volume with and without compressor. Compressors: specifications and dimensioning, automatic control, installation, operation and maintenance.

3. PRESSURE FILTERS

Functioning principles. Parts. Types: sand, diatomaceous. Specifications and dimensioning. Calculation of filtration equivalent area. Connection to pipes, valves and control instruments.

4. WATER SOFTENER

Functioning principles. Types. Characteristics. Ionic interchange. Specifications and dimensioning. Softening. Piping, valves and control instruments.

5. METERS

Flow meters. Functioning principles. Types: differential, helix, velocity, volumetric. Characteristics. Specifications and selection.

Pressure meters: types, characteristics, specifications and selection. Thermometers: types, characteristics, specifications and selection.

6. DISPENSERS

Types: gravimetric, volumetric. Characteristics. Specifications and selection. Applications.

7. CHLORINATION EQUIPMENT

Hypo-chlorinators: free discharge, flow, diffusion. Chlorinators: pressure, vacuum. Specifications and selection.

8. MIXERS

Types: rotating, jet. Stirrers. Characteristics, specifications, selection and application.

Hot water generators. electric, gas petroleum. Steam. Characteristics, specifications and selection.

9. OPERATIONS AND MAINTENANCE

Operation of machines, equipment and instruments. Preventive, corrective and predictive maintenance.

V. METHODOLOGY

The course develops through theory and practice sessions. In theory session, the instructor presents the concepts and methods. In practice sessions, students apply concepts and methods to solve different problems related to machines and instruments specifications and selection for given situations and conditions. At the end of the course, students present and defend a design report. Active student participation is encouraged throughout the course.

VI. EVALUATION FORMULA

The average grade PF is calculated as follows:

$$PF = (EP + EF + PC) / 3$$

EP: Mid term exam EF: Final exam

PC: Average of quizzes including final report

VII. BIBLIOGRAPHY

1. SANITARY INSTALLATIONS

Angelo Gallizzio
Hoepli Editions. Madrid, Spain

2. WATER PURIFICATION AND TREATMENT OF RESIDUAL WATER

Fair, Geyer, Okun
Limusa Editions, Mexico