Date:	**REGISTRATION OF COURSES**	RESPONSIBLE OF REGISTRATION:

AREA OF KNOWLEDGE	SUB-AREA	UNDERGRADUATE	POSTGRADUATE
BASIC SCIENCES			
ECONOMICS AND SOCIAL SCIENCES			
HEALTH SCIENCES			
ENGINEERING, ARCHITECTURE AND TECHNOLOGY	**INSTALLATIONS**	**X**	
EDUCATION SCIENCES			
HUMANITIES AND ARTS			
AGRICULTURAL AND SEA SCIENCES			
MILITARY ARTS AND SCIENCES			
SAFETY AND CIVIL PROTECTION			
INTERDISCIPLINARY			
OTHERS			

ADSCRIPTION OR BRANCH (ES):

FACULTY	ARCHITECTURE AND URBANISM
SCHOOL	ARCHITECTURE
INSTITUTE	
DEPARTMENT	
OTHERS	TECHNOLOGY SECTOR

COURSE:

NAME	BUILDING SERVICES 97
CODE	2064
EXECUTIVE UNIT	
CLASSIFICATION	Compulsory
APPROVAL DATE	
UPDATE DATE	
APPROVAL AUTHORITY	
CREDIT UNITS	3 (THREE)
HOURS/WEEK	4.5 (1.5 HOURS EACH AREA)
REGIMEN	SEMI-ANNUAL
ACADEMIC PERIODS	REGULAR
REQUIREMENTS	FIRST CYCLE CIMPULSORIES
PROFESSOR	AREA PROFESSORS

PURPOSES

The course, which is named “BUILDING SERVICES (INSTALATIONS)”, is constituted by 3 areas of services or systems in buildings; plumbing systems, mechanical systems and electrical systems.

Is intended that the architecture student achieve to visualize the existing relationship between the architecture, the structure of the building and the rest of systems.

LEARNING OBJECTIVES

At the end of the course the student will be able to:

Regarding Electrical Systems:

1) Identify the components of the urban electrical network in all its forms.
2) Identify the components of the electrical network within the building
3) At architectural preliminary level, pre-dimensioning of the necessary spaces for the placement of the main equipment of the electrical systems.
4) Learn the basic principles of lighting, the different lamps types and bulbs, as well as a design methodology and lighting calculation.
5) Learn the basis of the electrical design
6) Identify the vertical integration of the electrical systems with the building.

Regarding Mechanical Systems:

1) Identify the derivative variables of transporting systems within the building and their relations with other components.
2) The student will be capable to select the suitable climate control system to particular needs of the building and will identify its interrelation with other systems.

Regarding Security Systems:

1) The student will identify the security needs in architecture and the most suitable systems for such accomplishment.

Regarding Plumbing Systems:

1) The student will identify the components and configuration of the supply and wastewater networks of buildings and their relation with the architectural object.

CONTENTS

ELECTRICAL SYSTEMS

TOPIC 1: Principles of electricity. Calculation of current and electrical power. Generation of electricity. Transmission of electricity. Electrical networks in the urban area, use of transformers.

TOPIC 2: Study of the electrical network inside the building. Electric connection, room of main switches, quarter of electrical energy meters and electricity duct. Methodology for calculating the space required for the location of these spaces within the building.

TOPIC 3: Study of the basic principles of the phenomenon of vision and light. Study of the different types of bulbs and lamps. Study of the Lumen Method for the design and calculation of lighting of indoor environments

TOPIC 4: Study of the different types of power supply systems, Systems of 1 phase and neutral, 2 phases and neutral, 2 phases and 3 phases and neutral. Current calculation in each of these systems. Use of cable and pipe tables, criteria for their use. Design of the electrical installations of a house of small dimensions. Rush calculation electrical of a building.

TOPIC 5: Study of signal systems. Telephony, Intercommunication, Television and Data.

TOPIC 6: Vertical diagrams of electricity, telephony, intercommunication and television.

PLUMBING SYSTEMS

1. INTRODUCTION: Importance of the course, Scope, Evaluation System, Classes attendance. Textbooks for Plumbing and Fire Fighting Systems (COVENIN). Introduction with review of elementary physics. FLUIDS PROPERTIES: Weight, Mass, Specific Weight, Density, Specific Gravity. Importance of fluids. Usual measurement systems: Metric, Imperial. Review of the Metric System.

2. Conversion of units: Metric system - Imperial. Dimensional analysis. (Assignment). HYDROSTATIC: Static Pressure and Pressure Intensity. Variation of the Intensity of pressure with height. Examples. Absolute Pressure and Relative Pressure. Atmospheric pressure. Pressure units. Manometers and Barometers. Total force due to pressure. (ASSIGNMENT). Examples Push and float. (ASSIGNMENT)

3. HYDROCENETICS AND HYDRODYNAMICS: Continuity equation. Energy of water in motion: Bernoulli's theorem. (ASSIGNMENT). Practical applications of the Bernoulli equation. (ASSIGNMENT). Load Losses: a) By friction (William-Hazen, Darcy-Weisbach) b) Turbulence (Accessories).

4. OFFICIAL GAZETTE READING:

1st Chapter: General Provisions.
2nd Chapter: Of the Dimensions of the premises.
3rd Chapter: Characteristics of floors, walls and ceilings.

4th Chapter: Lighting and Natural Ventilation of establishments of buildings.
5th Chapter: Lighting and Artificial Ventilation of establishments of buildings.

5. OFFICIAL GAZETTE READING:
6th Chapter: General Provisions on Water Supply Systems and the Disposal of sewage and rainwater in buildings.
7th Chapter: Water allocations for the buildings. (ASSIGMENTS)
8th Chapter: Sanitary pieces.
9th Chapter: Type and required number of sanitary pieces to install in buildings.
10th Chapter: General provisions on the water supply systems of buildings.
11th Chapter: Of the storage tanks for drinking water for buildings.

6. DOTACION WATER STORAGE TANKS CALCULATIONS.
Dimensioning, Location, Types. (Assignment). Usual flows: Medium, Maximum, Adduction, Pumping.
OFFICIAL GAZETTE READING.
16th Chapter: Materials, joints, connection parts and valves to be used in the systems of water supply and distribution of buildings.
17th Chapter: Installation of the pipes of the water supply system.
18th Chapter: Protection of public water supply systems and buildings, against the possibility of contamination by dangerous connections, by investments in the water flow in the pipes and for other reasons.
LOAD LOSSES. Concept, Exercise.

7. OFFICIAL GAZETTE READING.
19th Chapter: Water distribution system pipes calculation. TABLES, SPENDING UNITS, PROBABLE SPENDING (Hunter). Beginning of a building exercise. (ASSIGMENT).
End of building exercise, gravity water supply. Application of the method used to solve a building water supply by gravity. Elementary concepts of pumping. Repetition of building's exercise, by pumping water supply.

8. FIRST PARTIAL EXAM

9. OFFICIAL GAZETTE READING
12th Chapter: Pumps and motors for the water supply systems of buildings.
13th Chapter: Hydropneumatics equipment for the water supply systems of buildings.
14th Chapter: Water supply system in buildings by direct pumping.
15th Chapter: Production, storage and distribution of hot water systems in buildings.
20th Chapter: Inspection and testing of the water supply system of buildings.
21st Chapter: Cleaning and disinfection of the water supply systems of buildings.
22nd Chapter: Sanitary pieces traps.

10. PUMPING SYSTEM CALCULATION

OFFICIAL GAZETTE READING.

23rd Chapter: Ducts and branches of drainage, downspouts and wastewater sewers. (ASSIGNMENT).

24th Chapter: Materials, connection pieces and joints for conduits and drainage branches, downpipes and sewage in buildings.

25th Chapter: Of the installation of the conduits and branches of drainage, downspouts and sewers of waters served.

Chapter 26th: Cloacal Ventilation. (ASSIGNMENT)

11. OFFICIAL GAZETTE READING.

27th Chapter: Mouths for cleaning and visit required in the sewage systems in buildings.

28th Chapter: Indirect drainage of sewage.

29th Chapter: Installation of interceptors and separators

12. OFFICIAL GAZETTE READING.

30th Chapter: Sewage pumping system.

31st Chapter: Inspection and testing of wastewater drainage system.

32nd Chapter: Collection, conduction and Disposition of rainwater. (ASSIGNMENT).

13. OFFICIAL GAZETTE READING

33rd Chapter: Storage and transfer of solid waste in buildings.

34th Chapter: Particular systems for the treatment and disposal of wastewater.

35th Chapter: Pit latrines and other methods for the disposal of excreta without carrying water.

36th Chapter: Buildings and establishments destined to public spectacles and public meetings.

14. 37th Chapter: Buildings and establishments destined to schools.

38th Chapter: Pools

39th Chapter: Definitions

15. SECOND PARTIAL EXAM

MECHANICAL SYSTEM:

1) Horizontal and vertical transport, operating equipment, spatial implications, current regulations. Core vertical circulation and its influence on the design of high-rise buildings. Relationship with the structure. Current regulations.

2) Artificial ventilation and air conditioning. Air conditioning, systems and selection criteria, location. Spatial implications and current regulations.

SYSTEMS AND SECURITY:

1) Security as a determinant in Architecture, types of risks and forecasts. Current normative.

2) Detection and alarm, exhaust means maintenance, lighting and pressurization, extinction.

INSTRUCTIONAL STRATEGIES

ELECTRICAL SYSTEMS:

The usual methodological strategies in the course are:
Lectures and their explanations
Demonstrations
Interrogations

PLUMBING SYSTEMS:

Theoretical classes reinforcing the physical foundation.
Reading and explanation of current sanitary regulations.
Assignments to reinforce contents
Exams for evaluation.
Preparation of a complete plumbing system project.

INSTRUCTIONAL MEDIA

ELECTRICAL SYSTEMNS:

It makes use of essential means and additional means. The essential means used are:

1) Linguistic expression
2) Images

The additional means used are:

1) slide projector
2) Transparency projector and
3) occasionally, video-beam.

EVALUATION

Each professor, within their academic freedom, carries out his evaluation throughout of the semester according to the most appropriate criteria to their purposes.
At the end of the semester, teachers from the 3 SYSTEMS areas define an average mark of the course for each student.
The course is the reason for the final exam and repair exam, sectorial.

TEXTBOOKS (If possible, according to contents)

ELECTRICAL SYSTEMS:

Each professor has elaborated their Guide for the Student

PLUMBING SYSTEMS:

1. MINISTERIOS DE SANIDAD Y ASISTENCIA SOCIAL Y DEL DESARROLLO URBANO. *Normas Sanitarias para Proyecto, Construcción, Reparación, Reforma y Mantenimiento de Edificaciones.* Gaceta Oficial de la República de Venezuela, Nº 4.044 Extraordinario, Caracas 8/9/88.

2. NYERGES V., NICOLAS. Instalaciones Sanitarias para Edificios. Facultad de Arquitectura y Urbanismo. Universidad Central de Venezuela. Caracas 1966.

3. GILES V., RANALD. Mecánica de los Fluidos e Hidráulica. Schaum & Mc G-Hill.

4. MINISTERIO DE SANIDAD Y ASISTENCIA SOCIAL. Normas Sanitarias para Proyecto, Construcción, Reparación y Reforma de Edificios. Gaceta Oficial de la República de Venezuela, Nº 752 Extraordinario, Caracas 26/2/62.

5. OLIVARES, ALBERTO. Cálculo de Distribución de agua para edificios. Caracas 1952.

6. TATÁ C., GUSTAVO A. Aspectos fundamentales de Diseño y Cálculo en instalaciones de aguas blancas en edificios. ULA, Mérida.

7. TATÁ C., GUSTAVO A. Aspectos constructivos de Instalaciones de Aguas Blancas, Metodología de diseño y Cálculo en quintas bajo el sistema de suministro directo. ULA, Mérida.

8. TATÁ C., GUSTAVO A. Sistemas de distribución de agua potable en edificios. Diseño y Cálculo. ULA, Mérida.

9. TATÁ C., GUSTAVO A. Diseño y Cálculo de instalaciones de Aguas Servidas en edificios. ULA, Mérida.

10. LOPEZ R., LUIS G. AGUA, Instalaciones Sanitarias en los edificios. Maracay 1.990

11. COVENIN. Normas de Prevención y Protección contra incendios. Caracas. (Son varias Normas)