

**1. General information****Course:** BUILDING INSTALLATIONS I**Type:** CORE COURSE**Degree:** 315 - UNDERGRADUATE DEGREE IN BUILDING ENGINEERING**Center:** 308 - SCHOOL POLYTECHNIC OF CUENCA**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 59313**ECTS credits:** 9**Academic year:** 2021-22**Group(s):** 30**Duration:** AN**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** JOAQUIN FUENTES DEL BURGO - Group(s): 30

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2. Pre-Requisites

It is recommended that the student enrolls in the subject when he has passed the following subjects

Mathematics Fundamentals I

Mathematics Fundamentals II

Physics Fundamentals I

Physics Fundamentals II

Architectural Drawing I

Construction Materials

Construction I

Construction II

3. Justification in the curriculum, relation to other subjects and to the profession

This subject, eminently technological, should make known, study and evaluate, within the time possibilities of the curriculum, the answers that man has provided to the establishment and control of different internal environmental conditions, influencing these conditions on:

- Survival and safety (protection against fires, electric shocks, intrusions, etc.).
- Health (quality of air, water, hygiene and sanitation, etc.).
- Performance and comfort (visibility, climate comfort, hearing, movement and transport of people and things, etc.).

Nowadays we can not understand a building without the basic services of water supply, drainage and sanitary, electricity, lighting, air conditioning, telecommunications, etc. While the structure is the skeleton and the envelope the skin, the facilities constitute the circulatory system (energy, fluids, information, etc.).

In this field there are continuous technological developments, standards and standards changes that condition the work of professionals dedicated to the project, assembly, maintenance and control of building facilities, which leads to a practical study and a systematic check of the facts as basic work tool, without doubting or disregarding the theoretical flow of information necessary to understand and analyze the processes described.

The actions that at professional level have relation with the facilities can be very varied. In the preliminary study of the project of a building whose execution will be directed, the Building Engineer must recognize and differentiate the projected facilities, relating them to the rest of the construction, visualizing the building as a body. In this phase, the necessary construction details for the execution of the installations will be prepared or planned, looking for the solutions that best suit the structural and constructive configuration of the building. During the construction of the building they must have the necessary knowledge to supervise, control and plan the assembly work, as well as the tests and inspections that have to be carried out on the assembled installations.

For these tasks, the Building Engineer needs to know and know how to apply the regulations and regulations that govern the different types of facilities. It should not be forgotten that many of these regulations have a marked technical nature, a

situation that requires a minimum level of theoretical knowledge to understand and apply properly.

Considering all the above, it is essential to know the intrinsic functioning of the facilities, in order to know which objective and function meet the elements that compose it, its calculation and sizing. In this way, it will be possible to analyze the designs whose execution has to be supervised, as well as to be able to carry out own designs in the realization of projects, within the competences of the knowledge and profession of the Building Engineer.

Knowing the materials used in the realization of the facilities acquires a vision of the behavior of the same, not only during its assembly, but during its operation; the precautions that must be taken when assembling them, the incompatibility between materials and their installation conditions. In addition, it will be possible to plan and take control of the maintenance of the installations executed in buildings, a task that is becoming increasingly relevant in this field.

In addition, the Building Engineer must know how to perform the analytical calculations of the different facilities, as well as the management of abacuses and tables for the calculations and verifications that have to be carried out in the design phases or in the evaluation of solutions on site, as well as in the solution of the deficiencies that may exist at the project level.

General and specific software will be used as tools for sizing facilities, supported by the knowledge necessary to verify the results obtained. The computers are considered complementary accessories for the Building Engineer, they do not substitute him, they revalue him, making him more essential, but demanding a concise knowledge of the operation of the facilities.

In the course will try to reach a balance between the knowledge of design, materials, systems, elements, execution, maintenance and sizing, because they are all related to each other.

4. Degree competences achieved in this course

Course competences

Code	Description
E20	Knowledge of the evaluation of the environmental impact of the building and demolition processes, of the building sustainability, and of the procedures and techniques to evaluate the energy efficiency of the buildings.
E21	Ability to apply technical regulations to the building process, and generate documents of technical specification of building procedures and construction methods.
E22	Ability to apply the specific regulations on facilities to the building process.
E24	Ability to constructively develop the building's facilities, control and plan their execution and verify the service and reception tests, as well as their maintenance.
G01	Ability for analysis and synthesis
G04	Problem resolution
G05	Decision making
G06	Critical thinking
G07	Teamwork
G12	Autonomous learning
G15	Sensitivity to environmental issues
G18	Initiative and entrepreneurial spirit
G19	Motivation for quality
G21	Command of Information and Communication Technologies (ICT)
G22	Correct oral and written communication

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Use measuring devices applied to the control and operation verification of the services, as well as handle tools.

Know the different components and basic elements that constitute the services as well as their intrinsic functioning.

Know the materials used in the realization of the different services, studying their characteristics and the properties related to the application that is being given.

Know and identify the systems that compose the fixed urban facilities and buildings.

Understand the physical phenomena that govern the services operation.

Apply the calculation methods in the sizing and evaluation of urban and building services.

Know the execution systems of the services, as well as their control and their maintenance tasks.

Know and use the rules and regulations that govern the design, calculation, execution and control of the services.

Develop the ability to observe and analyze installations in the assembly phase or already executed, to increase the practical continuous training and the critical sense necessary for professional development.

6. Units / Contents

Unit 1: Indoor hydraulic facilities of buildings.

Unit 1.1 Fluid flow equations.

Unit 1.2 Flow in channels and open pipes.

Unit 1.3 Centrifugal pumps.

Unit 1.4 Cold water facilities. Generalities.

Unit 1.5 Constituent elements of the water facilities. Materials

- Unit 1.6** Water facilities sizing.
- Unit 1.7** Water elevation facilities
- Unit 1.8** Subject practices.
- Unit 2: Hot water supply systems.**
- Unit 2.1** Production and distribution of sanitary hot water.
- Unit 2.2** Hot water supply systems sizing.
- Unit 3: Fire protection facilities**
- Unit 3.1** Fire protection introduction.
- Unit 3.2** Fire detection facilities.
- Unit 3.3** Extinguishing equipment.
- Unit 4: Sanitation and drainage.**
- Unit 4.1** Sanitation facilities in buildings.
- Unit 4.2** Materials of sanitation facilities.
- Unit 4.3** Sanitation and drainage networks sizing.
- Unit 4.4** Purification and discharge
- Unit 5: Ventilation systems.**
- Unit 5.1** Building ventilation facilities.
- Unit 5.2** Building ventilation facilities sizing.
- Unit 5.3** Subject practices.
- Unit 6: Gas facilities, components and materials.**
- Unit 6.1** Gas facilities. Generalities
- Unit 6.2** Gas facilities. Materials and installation systems.
- Unit 6.3** Liquefied petroleum gas storage facilities.

ADDITIONAL COMMENTS, REMARKS

The order in which the subjects are taught, as well as their extension, will depend on the real hours available during the academic course.

The teaching of the topics will be sequential.

7. Activities, Units/Modules and Methodology							
Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E21 E22 E24 G01 G04 G05 G06 G07 G12 G15 G18 G19 G21 G22	1.54	38.5	N		heoretical-practical explanation in the classroom of the basic contents related to the different facilities that affect the building (at the urban level (to a lesser degree) and in the inside), using the methodology of the formal presentation of the contents and the use of the technique of the question.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E21 E22 E24 G01 G04 G05 G06 G07 G12 G15 G18 G19 G21 G22	1.5	37.5	N		Resolution of exercises and - problems in a participatory manner in the classroom.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E24 G05 G07 G12 G19 G22	0.04	1	Y	N	
Computer room practice [ON-SITE]	Practical or hands-on activities	E21 E22 G01 G04 G05 G06 G07 G12 G19	0.2	5	Y	N	Realization of practices managing general software (EXCEL) or specific to the design and sizing of facilities (EPANET, REVIT).
Study and Exam Preparation [OFF-SITE]	Self-study	E21 E22 E24 G01 G06 G12	2.2	55	N		- Subject study
Other off-site activity [OFF-SITE]	Problem solving and exercises	E21 E22 E24 G04 G06 G07 G12 G19 G21 G22	3.12	78	N		Performing exercises and problems - applying the knowledge included in the chapters.
Final test [ON-SITE]	Assessment tests	E21 E22 E24 G01 G04 G19 G22	0.16	4	Y	Y	Take the exam of the subject
Practicum and practical activities report writing or preparation [OFF-SITE]	Combination of methods	E21 E22 E24 G01 G04 G05 G06 G07 G12 G15 G18 G19 G21 G22	0.08	2	Y	N	Partial realization of the technical project of a building facilities.
Other on-site activities [ON-SITE]	Assessment tests	E21 E22 E24 G04 G06 G19 G22	0.16	4	Y	N	Take an exam of the content taught during the first semester.
Total:			9	225			
Total credits of in-class work: 3.6			Total class time hours: 90				
Total credits of out of class work: 5.4			Total hours of out of class work: 135				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

	Continuous	Non-	
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Evaluation System	assessment	continuous evaluation*	Description
Final test	80.00%	80.00%	It will be formed by two parts: Theory and Problems. - Theory: This part will be an exam composed by questions of type test (in this type of questions, every 3 incorrect answers will cancel a valid answer), and questions applied (of theoretical development and / or practical application). -Problems: This part has 2 or 3 problems. At the beginning of the course the students will be informed if partial exams will be carried out and the conditions that will be imposed to pass the subject in case of doing them. The conditions of this modality will be published in computer support and paper, making it available to students
Assessment of activities done in the computer labs	10.00%	10.00%	Each practice will be evaluated on 10 points. You must obtain a minimum score in each practice of 3 points. In case of obtaining a lower grade, the grade obtained will not be taken into account in the final grade of the subject.
Laboratory sessions	5.00%	5.00%	Each practice will be evaluated on 10 points. You must obtain a minimum score in each practice of 3 points. In case of obtaining a lower grade, the grade obtained will not be taken into account in the final grade of the subject.
Practicum and practical activities reports assessment	5.00%	5.00%	Each practice will be evaluated on 10 points. You must obtain a minimum score in each practice of 3 points. In case of obtaining a lower grade, the grade obtained will not be taken into account in the final grade of the subject.
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

Exam evaluation criteria

- Part of Theory (equivalent to 30% of the exam).

You must obtain a minimum qualification corresponding to 30% of the total qualification of this part to pass the exam

- Part of Problems (equivalent to 70% of the exam).

To pass the exam in each problem, you must obtain a minimum grade corresponding to 30% of the total score of the same.

It will be necessary to obtain a score equal or superior to 4 points in the exam to be able to add the qualification obtained in practices. In case of obtaining a grade below 4 points the exam will be considered suspended.

Non-continuous evaluation:

The student, who justifiably cannot attend the training activities regularly, must notify the teacher of the subject at the beginning of the semester and may carry out the activities at a time agreed with the teacher and present them in the period of ordinary or extraordinary exams.

Exam evaluation criteria

- Part of Theory (equivalent to 30% of the exam).

You must obtain a minimum qualification corresponding to 30% of the total qualification of this part to pass the exam

- Part of Problems (equivalent to 70% of the exam).

To pass the exam in each problem, you must obtain a minimum grade corresponding to 30% of the total score of the same.

It will be necessary to obtain a score equal or superior to 4 points in the exam to be able to add the qualification obtained in practices. In case of obtaining a grade below 4 points the exam will be considered suspended.

Specifications for the resit/retake exam:

Exam evaluation criteria

- Part of Theory (equivalent to 30% of the exam).

You must obtain a minimum qualification corresponding to 30% of the total qualification of this part to pass the exam

- Part of Problems (equivalent to 70% of the exam).

To pass the exam in each problem, you must obtain a minimum grade corresponding to 30% of the total score of the same.

It will be necessary to obtain a score equal or superior to 4 points in the exam to be able to add the qualification obtained in practices. In case of obtaining a grade below 4 points the exam will be considered suspended.

In case of having suspended a practice, you can take an exam of the practice / s on the same dates and times established in the official exams. The exam will evaluate the competences and skills contained in the practice.

Specifications for the second resit / retake exam:

Exam evaluation criteria

- Part of Theory (equivalent to 30% of the exam).

You must obtain a minimum qualification corresponding to 30% of the total qualification of this part to pass the exam

- Part of Problems (equivalent to 70% of the exam).

To pass the exam in each problem, you must obtain a minimum grade corresponding to 30% of the total score of the same.

It will be necessary to obtain a score equal or superior to 4 points in the exam to be able to add the qualification obtained in practices. In case of obtaining a grade below 4 points the exam will be considered suspended.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Final test [PRESENCIAL][Assessment tests]	4
Practicum and practical activities report writing or preparation [AUTÓNOMA][Combination of methods]	2
Other on-site activities [PRESENCIAL][Assessment tests]	4

General comments about the planning: The hours assigned and temporary distribution will depend on the real hours available during the academic course.

Unit 1 (de 6): Indoor hydraulic facilities of buildings.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	16
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	16
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	12.5
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	33.15

Unit 2 (de 6): Hot water supply systems.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	6.5
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	7.8

Unit 3 (de 6): Fire protection facilities

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	6
Computer room practice [PRESENCIAL][Practical or hands-on activities]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	10.6
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	15.6

Unit 4 (de 6): Sanitation and drainage.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	13
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	7.8

Unit 5 (de 6): Ventilation systems.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	6.5
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	7.8

Unit 6 (de 6): Gas facilities, components and materials.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	5.9
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	5.85

Global activity

Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	38.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	37.5
Computer room practice [PRESENCIAL][Practical or hands-on activities]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	55
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	78
Final test [PRESENCIAL][Assessment tests]	4
Practicum and practical activities report writing or preparation [AUTÓNOMA][Combination of methods]	2
Other on-site activities [PRESENCIAL][Assessment tests]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1
Total horas: 225	

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
ARIZMENDI BARNES, L.J.	Instalaciones urbanas. Infraestructuras y planeamiento. Tomo II.	Bellisco				
ARIZMENDI BARNES, L.J.	Cálculo y normativa básica de las instalaciones en los edificios. Tomos I y II.	Eunsa				
ARIZMENDI BARNES, L.J.	Ejemplos de proyectos de instalaciones en edificios de vivienda.	Universidad de Navarra, D.L.	Pamplona		1996	
ATECYR	Guía técnica de agua caliente sanitaria central	IDAE	MADRID		2010	Básico
ATECYR	Guía técnica de selección de equipos de transporte de fluidos	IDAE	MADRID		2012	Básico
ATECYR	Guía técnica para el diseño y cálculo del aislamiento térmico de IDAE		MADRID		2007	Básico

Conducciones de aguas y equipos					
Agüera Soriano, J.	Mecánica de fluidos incompresibles y turbomáquinas hidráulicas	Ciencia 3			Básico
FRAGUELA FORMOSO, J.A. GÁZQUEZ.	Instalaciones de protección contra incendios.	El Instalador (CONAIF)			
FUMADÓ ALSINA, J.L.	Las instalaciones de servicios en los edificios I.	Comisión de Asesoramiento Tecnológico del Colegio Oficial de Arquitectos de Galicia			
FUMADÓ ALSINA, J.L.	Climatización de edificios.	Ediciones del Serbal.			
GALDÓN TRILLO, F.; CALVO VILLAMARÍN, T.	Curso de Instalador e calefacción, climatización y agua caliente sanitaria.	El Instalador.			
GARCÍA VALCARCE, A. et al.	Manual de edificación. Evacuación de aguas de los edificios.	Departamento de Edificación - E.T.S.A.- Universidad de Navarra.			
GUERRA CHAVARINO, E.; et al.	Apuntes de los cursos para instaladores de gas IG-I, IG-II, IG-III, IG-IV.	El Instalador.			
González Lezcano, R.A.; Echevarría Trueba, J.B.; Morollón Ronda, C.	Seguridad en caso de incendio para diseñadores de edificios	Ediciones Asimétricas			2016
González Lezcano, R.A.; Echevarría Trueba, J.B.; Morollón Ronda, C.; Hormigós Jiménez, S. JIMÉNEZ, J.; MARTÍNEZ, R.	Seguridad en caso de incendio para diseñadores de edificios	Ediciones Asimétricas			2016
MARTÍN SÁNCHEZ, F.	Curso de instalador de fontanería. Manual de instalaciones de fontanería y saneamiento .	El Instalador AMV Ediciones			Básico
ROMERO SEDÓ, A.M.; ARRUE BURILLO, P.	Instalaciones hidrosanitarias en los edificios y redes. Tomo II. Problemas.	Ediciones VJ.	Valencia		Básico
SUÁREZ LÓPEZ, J.; MARTÍNEZ ABELLA, F.; PUERTAS AGUDO, J.	Manual de conducciones URALITA. Sistemas de conducciones en infraestructuras, riego y edificación.	THOMSON-PARANINFO.			
Soriano Rull, A.	Evacuación de aguas residuales en edificios	Marcombo			Básico
Soriano Rull, A.	Instalaciones de fontanería domésticas y comerciales.	Marcombo			Básico
ÚBEDA GÁZQUEZ, P.	Seguridad contra incendios. Descripción y principios de diseño de equipos e instalaciones.	ITASCI, S.L.			Básico
Hall, F.; Greeno, R.	Reglamento de Instalaciones Térmicas de Edificios (RITE)				
Grondzik, W.T.; Kwok, A.G.	Reglamento de Instalaciones de Gas				
R. H. Garrett	Reglamento de Instalaciones de Protección contra Incendios				
A.F.E. Wise; J.A. Swaffield	Reglamento de Seguridad contra incendios en Establecimientos Industriales (R.D. 2267/2004)				
Timkow, P.; Tassou, S.; Kolokotroni, M & Jouhara, H.	Building Services Handbook	Routledge	Oxon, UK.		2013
Watkins, D.E.	Mechanical and Electrical Equipment for Buildings	Wiley	Chichester, West Sussex, UK		2011
Muscroft, S.	Hot and Cold Water Supply	Wiley	Oxford, UK		2011
Chadderton, D.V.	Water, sanitary and waste services for buildings	Butterworth Heinemann			2013
Ministerio de Fomento	Building Services Design for Energy Efficient Buildings.	Routledge			2019
	Documento básico SI - Seguridad en caso de incendios. Código Técnico de la Edificación				
	Documento básico HS -				

