Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

Coordinating unit: 300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering

Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering

Academic year: 2018

Degree: BACHELOR'S DEGREE IN AIRPORT ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING (Syllabus 2015). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2015). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE SYSTEMS ENGINEERING/BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2015). (Teaching unit Optional)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Definit a la infoweb de l'assignatura.

Others: Definit a la infoweb de l'assignatura.

Opening hours

Timetable: To make inquiries to the teachers, the students will be taken care of in leaving the class and, if it is not possible, they will arrange an appointment with the teacher through the email, in a schedule that is suitable for both.

Prior skills

Knowledge of statics, structures and resistance of materials. Materials technology.
Structural Mechanics. Reinforced concrete and steel structures.

Requirements

Continuum and Structural Mechanics.

Degree competences to which the subject contributes

Specific:

1. CE 19 AERO. Conocimiento aplicado de: la ciencia y tecnología de los materiales; mecánica y termodinámica; mecánica de fluidos; aerodinámica y mecánica del vuelo; sistemas de navegación y circulación aérea; tecnología aeroespacial; teoría de estructuras; transporte aéreo; economía y producción; proyectos; impacto ambiental. (CIN/308/2009, BOE 18.2.2009)
2. CE 21 AEROP. Conocimiento adecuado y aplicado a la Ingeniería de: La normativa específica de edificación; los procedimientos de control y ejecución de obras; el funcionamiento y la gestión del aeropuerto y el transporte aéreo. (CIN/308/2009, BOE 18.2.2009)
3. CE 22 AEROP. Conocimiento adecuado y aplicado a la Ingeniería de: Los métodos de cálculo y de desarrollo de las diferentes soluciones de edificación y pavimentación de aeropuertos; el cálculo de los sistemas específicos de los aeropuertos y sus infraestructuras; la evaluación de las actuaciones técnicas y económicas de las aeronaves; el manejo de las técnicas experimentales, equipamiento e instrumentos de medida propios de la disciplina; las técnicas de inspección, de control de calidad y de detección de fallos; los planes de seguridad y control en aeropuertos. (CIN/308/2009, BOE 18.2.2009)
4. CE 23 AEROP. Conocimiento aplicado de: edificación; electricidad; electrotecnia; electrónica; mecánica del vuelo;

300239 - EA-MP7 - Airport Buildings

hidráulica; instalaciones aeroportuarias; ciencia y tecnología de los materiales; teoría de estructuras; mantenimiento y explotación de aeropuertos; transporte aéreo, cartografía, topografía, geotecnia y meteorología. (CIN/308/2009, BOE 18.2.2009)
5. CE 7 AERO. Comprender el comportamiento de las estructuras ante las solicitaciones en condiciones de servicio y situaciones límite. (CIN/308/2009, BOE 18.2.2009)

Teaching methodology

The course consists of five hours a week of classes in the classroom. These hours are devoted to (1) the presentation of theoretical issues, where the teacher explains the concepts and materials for the course. This aspect represents 65% of the time devoted to classes. (2) the description and discussion of practical exercises (20% of the time), and (3) exercises and tests assessed (15% of the time). The course includes also a technical visit related to the subject matter of the course. In addition, the student must perform a number of exercises related to various topics of the course, as part of the guided activities to do outside the classroom. These exercises are evaluated. Support material is supplied in the form of detailed syllabus provided by the virtual campus ATENEA: contents, schedule of evaluation activities, guided learning and literature.

Learning objectives of the subject

Knowledge of the design, calculation, construction and maintenance of airport construction works regarding the structure and foundation structures, finishes and facilities.

Study load

Total learning time: 150h	Hours large group:	27h	18.00%
	Hours medium group:	15h	10.00%
	Guided activities:	24h	16.00%
	Self study:	84h	56.00%

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

Content

THE BUILDING AND ITS SUBSYSTEMS

Learning time: 24h

Theory classes: 3h
Practical classes: 2h
Guided activities: 2h
Self study : 17h

Description:

Features of the building relative to stability, protection and wellness. Analysis of the subsystems. Relationship between subsystems and functions. Introduction to the protective system. Elements of the external envelope of the building (facade and roof) and specific functions. The compartmentalization of the interior spaces. Coatings. Devices for regulation. Introduction to system facilities and equipment. General outline of a distribution network and differentiation between centralized and individual systems. General outline of a drainage system. Introduction to the main facilities. Introduction to the structural system. Basic conditions that the structure must meet. Fundamental structural elements. Global resistant mechanisms against vertical and horizontal actions. Global basic structuring. Global analysis and interaction between subsystems. Determinants introduced by the protection system and facilities on the structure. Easements and acceptable effects in different structural elements. General considerations on maintenance and life cycle of the building.

Related activities:

Individual (mandatory) assignment 1

Specific objectives:

Knowledge of features, elements and systems that constitute a building of the airport. Analysis of the problems arising from the interaction between the various subsystems (enclosures, installations and structures) and the main arrangements that allow optimize the overlap in the building. Knowledge of basic aspects of the life cycle of the building.

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

PHYSICS OF THE BUILDING

Learning time: 24h

Theory classes: 3h
Practical classes: 2h
Guided activities: 2h
Self study : 17h

Description:

The interior environment. Common features and values of environmental parameters inside buildings or premises. Effect of seasonal variation and external solicitations (climatic agents). Higrometric and thermal conditioning. Economic importance of thermal conditioning and energy saving. Approach the problem of heat flow in the cold season. Approach the same problem in hot season. Basic concepts of the theory of heat transmission. Calculation of the thermal resistance of different enclosures. Materials used for thermal insulation. Problems of condensation of water vapor in the enclosures. Fundamentals of air and vapor diffusion theory. Dew temperature and saturation pressure. Analysis of the formation of surface and interstitial condensation enclosures. Vapor barriers. Permeability of the closures before the passage of air. Practical exercises presented in class on checking the thermal behavior and the possible condensation of water vapor in a space. Nature and effects of the action of fire. Levels of action upon the occurrence of fires. Characterization of action "fire" and the response of buildings and their elements. Effects and response to fire from different materials and structural elements. Approach the conditions for protection. General methods and simplified for the verification of the fire resistance of structures. Treatment and requirements established in the regulations. Fireproof Coatings. Division of the building into sectors and analysis of the conditions of evacuation of the building in case of fire. Practice developed in the classroom on the practical implementation of methods and normative criteria related to the verification of the fire resistance of structural elements of the building. Impact of noise on acoustic comfort and need. Basics of acoustics. Isophonics curves. Definition and characteristics of "noise" in the solicitation. Emission sources and intensity. Aspects involved in the acoustic behavior of buildings: absorption resonance, reverb effects. Insulating capacity of the building. Frequency of coincidence. Influence of adjacent building elements. Treatment and prescriptions on sound insulation in the current regulations: general guidelines concerning planning and project buildings and facilities. Minimum insulation required for different structural elements of the building. Recommendations relating to emission levels and reverberation time. Insulation materials and acoustic resonators.

Related activities:

Individual (mandatory) assignment 2

Specific objectives:

Knowledge of the characteristics and parameters of the interior environment of the buildings. Analysis of the thermal conditions and the operation of the thermal insulation of the building. Presentation of the materials and the thermally insulating elements. Analysis of the higrotermic behavior of the building and the possible production of water vapor condensations. Practical implementation of concepts and the theoretical formulation regarding the verification of thermal conditions and condensation of water vapor. Knowledge of the effects of fires in buildings and the levels and solutions that are applicable for protection. Knowledge of the resistant behavior of various structural materials in front of the fire. Planning of the basic techniques of analysis of the buildings in front of the fire. Consideration of the evacuation conditions and the requirements that are derived for the design of the building. Demonstration of the practical application of the concepts and methods related to the verification of the fire resistance of the structure of the buildings. Knowledge of the acoustic behavior of the buildings and the solutions for the improvement of the levels of insulation and comfort. Consideration of the problem from the physical point of view. Compliance with current regulations and familiarization with improvement solutions.

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

THE PROTECTIVE SYSTEM	Learning time: 24h Theory classes: 3h Practical classes: 2h Guided activities: 2h Self study : 17h

Description:

General considerations on the outer envelope of the building. Morphology and functions of the outer envelope. Order and contact between the enclosure resistant, waterproof and heat. Problems related to the contact between the enclosure: incompatibility thermal formation of thermal bridges. Façades. Functions and specific problems. Façades for buildings with bearing walls. Arched facades for buildings. Covers. Functions and specific problems. Solutions homogeneous geometrical and watertight. Training covers evacuation: types, geometric requirements and materials used. Differentiation between indoor hot and cold deck. Training covers shutter. Partitions. Functions and specific problems of the partitions. Masonry partitions. In each case, training, conditions of use and stability.

Related activities:

Classes with presentation and analysis of real cases

Specific objectives:

Understanding the problems resulting from the contact between the structural and protective layers. Presentation of the problems of conventional solutions and offer optimal solutions. Presentation of the main types of solutions for façades, roofs and partitions, with their advantages and disadvantages.

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

STRUCTURAL ELEMENTS	Learning time: 57h Theory classes: 16h Practical classes: 8h Guided activities: 16h Self study : 17h

Description:

Nature of the various gravitational actions. Nature and characteristics of the different overloads of use. Basic types of wooden, reinforced concrete or prestressed, in situ or precast concrete, metal and mixed floors. Devices used to enhance the monolithic and rigid behaviour (compression layer, perimeter beams and stiffening joists). Forged one-way concrete core type. Analysis of resistant features along with the constructive aspects, specific types and uses more common. Elements of floors and conditions to be met. Elements of the floors and geometric conditions required. Moment-curvature diagram of a section of reinforced concrete. Methods based on the distribution of the plastic moments. Concept of active deflection, check of the deformability. Construction details for supports on various types of support elements. Overall reinforcement layout in floors. Detailed presentation in classroom of the practical process design and verification of a complete uniaxial floor. General types and range of use depending on the span and overload. Specific aspects of the resistant capacity. The method of virtual frames. Edge beams: importance, functions and sizing criteria. General criteria for the bidirectional floors. Punching: description of the mechanism of rupture and verification. Detailed presentation of the practical process in the classroom on the design and verification of a bidirectional floor.
Concept of prestressed floors. Advantages and durable construction of the use of post-tensioning for slabs. Type of post-tensioned floors. Specific technology for the post-tensioning of floors of buildings. Specific solutions and construction details. Introduction to the design. Composite steel and concrete floors: elements, components and fundamental characteristics. Types. Major structural possibilities and applications. Details for improved acoustic and fire behavior. Basic criteria of calculation. Construction details. The material components. Introduction to the surface foundations of the building. Main elements and structural types. Designing footings and foundation slabs. Use and design centering beams and tying beams. Use and design of walls. Specific construction details. Detailed presentation in class of practical application of criteria and methods relative to the design and verification of structural elements resistant surface of the foundations of a building. Introduction to the deep foundations of the building. Main elements and structural types. Use and design of piles. Specific construction details. Detailed presentation in class of practical application of criteria and methods related to the design and verification of resistant structural elements of the deep foundation of a building.

Related activities:

Individual (mandatory) assignments 3-4

Specific objectives:

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

Evaluation of actions susceptible to acting on floors. Knowledge of the different types of floors and devices used to guarantee their proper monolithism and the appropriate link to the vertical structure of the building. Knowledge of the types of one-way reinforced or prestressed concrete floors. Familiarization with the criteria and the process of calculation in service and in ultimate conditions. Knowledge of the constructive details. Practical demonstration of the design and resistant verification process of a one-way floor. Knowledge of the types of bi-directional reinforced concrete floors. Presentation of the criteria and the verification process in service and in the ultimate conditions. Knowledge of the constructive details. Analysis of the resistance to punching on pillars and presentation of specific reinforcement details. Practical demonstration of the design and resistant verification process of a bidirectional floor. Knowledge of the advantages of post-tensioning in the formation of building slabs. Presentation of specific constructive and technological aspects. Knowledge of the main characteristics and applications of composite steel sheet and collaborative concrete floors. Knowledge of the specific constructive elements and types of the surface foundations of the buildings. Practical demonstration relative to the design and resistant verification of a building foundation. Detailed presentation in the classroom of the practical application of the criteria and methods related to the design and verification of resistant structural elements of the deep foundation of a building. Practical demonstration related to the design and safety verification of a deep foundation of the building.

CONSTRUCTION OF AIRPORT BUILDINGS

Learning time: 21h

Theory classes: 2h
Practical classes: 1h
Guided activities: 2h
Self study : 16h

Description:
A review of the structural systems in buildings used in airport terminals, technical modules, towers and hangars. Systems of construction of buildings, technologies in the concrete construction, systems of formwork. Basic aspects of quality control of the buildings.

Related activities:
Technical visit to the Iberia hangar at the Airport of Barcelona - El Prat

Specific objectives:
Knowledge of structural systems applied to airport buildings.
Knowledge of procedures used in construction of airport buildings: technology of placement of concrete formwork systems, quality control, etc.

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

Planning of activities

Mid-term Exam	Hours: 1h 30m Guided activities: 1h 30m

Description:
Mid-term exam about the first part of the course

Specific objectives:
Continuous evaluation of Students

Final exam	Hours: 1h 30m Guided activities: 1h 30m

Description:
Exam about the second part of the course

Specific objectives:
Final assessment of students

Visita Técnica	Hours: 3h Guided activities: 3h

Description:
Technical visit related to objectives and contents of the course

Qualification system

Apply the evaluation criteria defined in Infoweb of the course.

Regulations for carrying out activities

Exams and exercises are to be submitted individually, unless expressly indicated otherwise.

Last update: 29-01-2019

300239 - EA-MP7 - Airport Buildings

Bibliography

Basic:

Calavera Ruiz, J. Proyecto y cálculo de estructuras de hormigón: en masa, armado y pretensado : [de acuerdo con la nueva instrucción EHE-08 : de acuerdo con el EUROC¿?DIGO EC-2]. 2ª ed. Madrid: INTEMAC, 2010. ISBN 8488764057.

Ministerio de Fomento. EHE-08 : instrucción de Hormigón Estructural : con comentarios de los miembros de la Comisión Permanente del Hormigó. 4ª ed. Madrid: Ministerio de Fomento, Centro de Publicaciones, 2010. ISBN 9788449808753.

Ministerio de Fomento. Guía de aplicación de la Instrucción de hormigón estructural : Edificación. Madrid: Ministerio de Fomento, 2002. ISBN 8449806267.

Marí Bernat, Antonio R. Formigó armat i pretensat : exercicis curts de bases de càlcul i estats límits, adaptat a la instrucció EHE-08 [on line]. 2a ed. Barcelona: Edicions UPC, 2009Available on: <http://hdl.handle.net/2099.3/36837>. ISBN 9788498803907.

Cudós Samblancat, Vicente. Cuadernos de ingeniería de aeropuertos. Ed. Creaciones Copyright Europa Empresarial, cop. 2004. ISBN 8460796736.