



STUDY PROGRAM OF THE UNIVERSITY COLLEGE OF PUBLIC WORKS **ENGINEERING YEAR 2009-2010**

FIRST YEAR

- LINEAL ALGEBRA

Course objectives: to express the habitual curves in explicit form and parametric description, to calculate matrices, determinants and equation systems; to understand Structural Algebra and to acquire skills in bilinear and quadratic equations, focusing on intrinsic trihedron and Frenet form.

- INFINITESIMAL CALCULUS

Course objectives: the use and applications of Taylor formula, applications of differential, integral and numerical calculus to Engineering, to solve differential equations with constant and variable coefficients, to understand and use the Laplace transformation (real parameter).

- TECHNICAL DRAWING

Course objectives: to acquire the basic concepts of Plane and Spatial Geometry to be applied to the Representation Systems, with special emphasis on: geometrical constructions and transformation, sketching, cartography, diedric system, axonometric projection, conical perspective and Computer Aided-Design (CAD).

- PHYSICS

Course objectives: to understand and study physical phenomena, to describe them by the physical magnitudes involved, and to develop mathematical expressions for the quantitative description of the laws of Physics.

- MECHANICS

The subject is divided into two different parts: Statics – as an introduction to the study of materials resistance- this first part covers the understanding of how the force systems act on any field, and the result of applying the force systems on bodies with some particular structural forms. Dynamics: this second part covers Kinetics and kinematic of a “point” object, and later on solid body or material points systems, focusing on the study of work and vibrations.



- CHEMISTRY

Course objectives: to introduce the physical-chemical principles of matter, chemical reactions and Chemistry of materials, to acquire the basic knowledge to tackle other more specific topics to be studied in later years, and to familiarize the student with the analysis methods used in quality control for certain types of materials as well as for the environment.

SECOND YEAR

- ELECTROTECHNICS AND LUMINOTECHNICS

Course objectives: to gain knowledge of the basic concepts and behavior of electrical circuits: applications to the consumption and saving of energy in public works projects; to understand the characteristics on service and behavior of electrical machines: transformers, synchronous machines, asynchronous machines and direct current machines. The course introduces to interior and exterior lighting projects.

- HYDRAULICS

Course objectives: to acquire the basic knowledge of fluid Hydraulics in both free and pressurized states. Numerical exercises and lab sessions are intended to direct the student to practical cases that can be found in professional life.

- ENGLISH

Course objectives: to learn the basic structures that will be found in civil engineering texts, in order to gain knowledge of the specific technical vocabulary not only for the civil engineering but also for other areas of engineering, science and technology.

- MACHINERY AND AUXILIARY RESOURCES

Course objectives: to acquire knowledge of all the mechanical, hydraulic and pneumatic elements and components which will be used in public works, in any application such as roadways, hydraulic systems, ports and railways.

- MATERIALS AND BUILDING WORK

Course objectives: to gain knowledge of the foundations of Science and Technology of Materials - focusing on construction materials- as well as to acquire basic concepts of building work and prefabrication technology.



- MATERIAL RESISTENCE

The subject is divided into three different parts: 1. Elasticity: study of the effects of forces on the interior of bodies with any shape. 2. Solicitations: to determine the behavior of a material under certain solicitation - tensile, flexural, torsion, compression. 3. Methods of calculus: Energy method and Cross method.

- TECHNICAL DRAWING: REPRESENTATION SYSTEMS

Course objectives: to study in depth the different representation systems, such as Diedric, contour planes, axonometric projection, central system and conical perspective. The student should be able to analyze and interpret any general and specific normalization, as well as to gain knowledge of the computing applications used in civil engineering - Computer Aided-Design (CAD) and Geographic Information System (GIS).

- TOPOGRAPHY AND PHOTOGRAMMETRY

Course objectives: to familiarize the student with the instrumentation, topographic methodologies, elevations, project replanning, the control of the deformation and displacement of structures and photogrammetric methods.

THIRD YEAR: COMMON SUBJECTS

- COMPUTER APPLICATIONS

Course objectives: to introduce the student to the most common computing applications used in civil engineering, in particular in the field of the design and calculus of structures, design of linear works, employing the most used programming language in civil engineering.

- ROADWAYS I

Course objectives: to introduce the student to the elementary techniques of the design, construction and exploitation of roads. The student will be introduced to the essential traffic concepts, as well as the legal requirements for the construction of both urban and rural roadways.

- CONSTRUCTION ENGINEERING

Course objectives: to teach the student to design, project and gain knowledge of the main construction materials used today: concrete – normal, reinforced, precast, pre- and post-stressed concrete- and metallic structures, in particular rolled steel.



- ACCOUNTING AND BUSSINESS ORGANIZATION

Course objectives: to introduce the student to the basic accounting, analyze the financial state of business and to apply the General Accounting Plan. The course involves the understanding of concepts such as bankruptcy proceedings for suspension of payments, merger processes, securities and stocks, expense accounting. The student will be trained to comprehend the economic cycles of construction companies.

- APPLIED GEOLOGY

Course objectives: to gain knowledge of the principles of Geology and its application in public works engineering. The course is divided into 30 theoretical units and 15 lab sessions.

- GEOTECHNICS AND FOUNDATIONS

Course objectives: to gain knowledge of the Soil Mechanics, Geotechnics and its applications in public work engineering. The course is divided into 30 theoretical units and 15 lab sessions.

- ENGLISH

Course objectives: to learn the basic structures that will be found in civil engineering texts, in order to gain knowledge of the specific technical vocabulary not only for the civil engineering but also for other areas of engineering, science and technology.

- LAW AND SAFETY AT WORK

Course objectives: to familiarized the student with the legal, fiscal and labour terminology; as well as to introduce the basic concepts of Civil, Commercial, Fiscal and Administrative law. The course involves the developing of road, railways, ports and urban planning regulations; the understanding of the law of contracts with the Civil Service; National Insurance and workplace safety regulations.

- ORGANIZATION, MEASURING AND ASSESSMENT OF WORKS

Course objectives: to transmit to the student the knowledge and experiences to enable them to participate in the projecting, organizing and managing of civil works, according to economic and safety criteria.



THIRD YEAR: SPECIALIZATIONS

The depth and significance of the building process of public works, requires highly qualified technical experts. For that reason, three different one year's specializations are offered to complete the knowledge and expertise of our Public Works Engineers.

SPECIALIZATION IN CIVIL CONSTRUCTIONS

The objectives of this specialization are to study, project, management and exploitation of civil works, within the established legal framework.

ROADWAYS II

Course objectives: The student will acquire the basic knowledge of the control of construction and exploitation of roads, focusing on design techniques, and taking the Spanish Regulations into consideration.

RAILWAYS, CABLE RAILWAYS AND TRANSPORT BY PIPE LINES

Course objectives: to gain knowledge of these three transport means, focusing both on their morphology and functionality, as well as the study of the history of these means. The student will be able to analyze real components and visit several works and installations.

ELECTRICAL INSTALLATIONS

Course objectives: to introduce the producing, transport and distribution of the power electrical energy. The course will study calculus methods, safety and regulations on electrical engineering applied to the public works.

HYDRAULIC WORKS

Course Objectives: to provide the student the specific skills, both from a theoretical and practical point of view, on all the elements related to the hydraulic works, like dams, canals, exploitations, etc.

MARITIME WORKS

Course objectives: to familiarize the student with the maritime mean in a technical way, to gain knowledge of the tools that provide understanding of the natural phenomena which are developed in the referred mean, as well as to introduce the study, design and calculation of the basic maritime works structures (dikes, piers, canals, breakwaters, etc), in order to understand their functionality and implication on Port Engineering. The course will also involve the study of several processes of the Coasts Engineering: coastal processes, morpho-dynamic, port-beach interaction, erosion phenomena and coast protection systems.

CONSTRUCTION DESIGNING

Course Objectives: to introduce the student to the most used construction methodologies in public works, focusing on the singular ones, as bridge building, sliding shuttering, tunnels shuttering, etc.



SPECIALIZATION IN HYDROLOGY

The objectives of this specialty are to study, project, management and exploitation of hydraulic works, and evaluate and analyze hydraulic resources and installations.

- WATER SUPPLY AND WASTEWATER SYSTEMS

Course Objectives: to introduce the main concepts of water supply and distribution networks as well as their different components. Subjects related to wastewater treatment plants will also be presented. The student will have to analyze some practical exercises about the dimensioning and calculation of drinking water supply and distribution networks.

- HYDRAULIC WORKS DESIGN

Course Objectives: To gain knowledge of the specific concepts in construction systems, both from the theoretical and practical point of view, of all the components related to hydraulic Works, like dams, canals, pipe lines, exploiting, etc.

- ENERGY POWER STATIONS AND NETWORKS

Course Objectives: to introduce the student to generation, transport and distribution of power electric energy. Self-generation and energy saving will be also introduced.

- HYDRAULIC II

Course Objectives: the main aim is to introduce the student to the different design techniques on Hydraulic systems, as well as to acquire the basic knowledge of river hydraulic engineering and functional aspects of superficial drainage for road or rail links.

- HYDROLOGY

Course Objectives: to gain basic knowledge of hydrologic phenomena and the different existing hydrological methodologies and techniques for their analysis and evaluation.

- TRANSPORTATION

Course Objectives: to show the student the transportation outlook, focusing on the current working means and their specific performative fields. Four different parts will be studied during the course:

1. Terrestrial transportation: roadways, railways, passenger and freight transport, cable railways.
2. Pipe line transport: analyzing the possibilities of this mean of transportation
3. Water transport: maritime, river and lake transport
4. Air transport: passenger and air cargo.



SPECIALIZATION IN TRANSPORT AND URBAN SERVICES

The objectives of this specialty are to study, project, management and exploitation of civil works related to roadways and railways, as well as traffic and urban planning and services.

- **TRAFFIC PLANNING AND DIMENSIONING**

Course Objectives: to introduce the student to traffic techniques on roads. The course will involve the study of concepts related to traffic and capacity, as well as the Spanish regulations concerning traffic planning management.

- **COORDINATION AND TRANSPORT ENGINEERING**

Course Objectives: to present the concepts of coordination and transport economy, as well as those related to Transport Engineering and their environmental impact. The course will also involve methodologies for development and assessment of projects.

- **RAILWAYS, CABLE RAILWAYS AND TRANSPORT BY PIPE LINES**

Course objectives: to gain knowledge of these three transport means, focusing both on their morphology and functionality, as well as the study of the history of these means. The student will be able to analyze real components and visit several works and installations.

- **SANITARY AND ENVIRONMENTAL ENGINEERING**

Course Objectives: to introduce the student to sewer systems networks, their main elements and used materials, as well as the knowledge of wastewater treatment. The course will also involve the analysis of existing techniques for solving sewer systems problems.

- **PORTS AND GOODS HANDLING**

Course Objectives: to familiarize the student with the current concept of port, its users and activities. Several initial lessons will be presented to introduce the student to the fundamentals of Maritime Engineering: swell, functionality and typology of maritime works focusing on port zones. The course will cover the following parts:

1. Maritime transportation: ship, traffics, port in the terrestrial-maritime transportation, administration and financial management.
2. Port facilities: maritime and overland access, services area, terminals and piers, special facilities.
3. Port planning: traffic prediction, physical and general planning and specific areas.
4. Air transport: passenger and air cargo.



- URBAN SERVICES

Course Objectives: to introduce the student to municipal services provision, among them:

1. Urban hygiene – waste treatment
2. Water supply and various energy resources
3. Maintenance of public roads and distribution networks
4. Funerary services
5. Water distribution networks

- URBAN TRANSPORT

Course Objectives: To study the concepts related to supply and demand of urban transportation, mobility, urban structure and basic infrastructures. The course will also show typical traffic problems and possible solutions for urban mobility, in the context of metropolitan areas, under the support of new technologies.

- TOWN AND MUNICIPAL PLANNING

Course Objectives: to introduce the student to the basic concepts of town and municipal planning, focusing on urban services, equipments and urban standards, build-ability and regulations. The course will present several practical exercises to familiarize the student with the usual calculation methodologies.

FINAL PROJECT

Once the student successfully passes all the courses, the Final Project should be elaborated and defended. The Project can consist of either the development of four technical works, on a variety of subjects proposed by the College, or a dissertation on a civil engineering project or research work, on a topic proposed by the student and subject to approval by the College.

The Final Project will be supervised by those lectures whose subjects are most closely related to the chosen topic.

Objectives: to challenge the student to produce a project on civil engineering, in which they will have to apply knowledge acquired throughout the degree course, prior to embarking on their professional career.