



COURSE SYLLABUS

Curso: **201 – CIVIL ENGINEERING**

Currículo: **19911**

Habilitation: Civil Engineering

Objective: The Undergraduate Program in Civil Engineering aims to give the student a Civil Engineering professional training to work in the areas of housing, the calculation of structures, civil and military works, transportation, sanitation and urbanization.

Title: Civil Engineer

Period for Course Competition: Minimum: 9 sem. Maximum: 18 sem.

Hours Required: UFSC: 4464 HS CNE: 3600 HS

Optional: 162 HS

Number of weekly lessons: Min: 14 Max: 31

Course Coordinator: Telephone: Prof. Luis Alberto Gómez
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NOTE: 1 Meeting is very close to 1 ECTS

Updated: 20140120



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Phase 01

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Introduction, role of the engineer in society, playing field, historical overview of civil engineering. The course at UFSC (history, organization, resources, laboratories, areas and ways of conducting research, curriculum) basic elements of the study and research in Civil Engineering. Bibliographical research and scientific communication. Technical standards. Presentation of projects as the main tool used in engineering.						
ECV5327	Engineer's Social Function and Training	Ob	36	2	(ECV1327 ou FIL1115)	
Introduction to the human visual system, ways of viewing human; Mongean projection system; basic building elements-point, line and plane; mechanisms for determining the true greatness - bounce and change of plan, construction of objects (modeling) Involving intersection, section and planification.						
EGR5213	Graphical Spatial Representation	Ob	54	3	EGR5212	
Introduction to the fundamental concepts of kinematics, dynamics and statics and laws of conservation of energy and linear momentum.						
FSC5101	Physics I	Ob	72	4	FSC1101	
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INE5201	Introduction to Computer Science	Ob	54	3	(CEC1101 ou CEC1128 ou CEC5201)	
Functions of one variable. Elementary functions. Understanding limits and continuity. A derivative. Applications of the derivative. Indefinite and definite integral.						
MTM5161	Calculus A	Ob	72	4	(MTM1131 ou MTM1161 ou MTM5801)	
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MTM5512	Analytic Geometry	Ob	72	4	(MTM1221 ou MTM5811)	
Matter. General Concepts. Atomic Theory. Atomic Structure. Electronic configuration. Atomic Orbital. Chemical bonds: ionic, covalent, metallic. Gas laws. Concept of chemical functions Mol. Mixtures. Solutions. Concentration of solutions. Chemical equations. Redox reactions. Introduction to chemical equilibrium, acids and bases, ph. Heat of reaction. Introduction to Thermochemistry.						
QMC5104	Basic Chemistry I	Ob	72	4	(QMC1104 ou QMC5105)	



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Phase 02

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Structure, function and dynamics of ecosystems. Effect of human activities on ecosystems. Legislation and Conservation of natural resources.						
ECZ5102 Conservation of Natural Resources	Ob	36	2	(BLG1140 eh BLG5303)		
Introduction to Technical Drawing freehand. Standards for the design. Fundamental techniques drawn freehand. Representation systems: 1st and 3rd dihedral. Orthogonal projection of simple parts. Views omitted. Dimensioning and proportions. Axométrica perspective, isometric, bimetric, trimetric. Perspective rider. Sketches quoted. Shadows. Sketches shaded.						
EGR5604 Technical Drawing I	Ob	54	3	(RTS1604 ou RTS5604)		
Natural waters and drinking water. Combustion. Solid, liquid and gaseous. Polymers. Metallic Corrosion. Binders. Waterproofing.						
EQA5114 General Chemical Technology B	Ob	90	5	(ENQ1114 ou ENQ5114 ou EQA5113) ou (ENQ1109 eh ENQ1110)	QMC5104	
Kinematics of rotation. Dynamic Rotation I. Dynamics of Rotation 2. Oscillations. Statics of Fluids. Fluid Dynamics. Waves in Elastic Medium. Sound Waves. Temperature. Heat and 1st Law. Kinetic Theory of Gases. Entropy and the 2nd Law.						
FSC5132 Theoretical Physics A	Ob	90	5	FSC1112	(FSC5101 eh MTM5161 eh MTM5512)	
Methods of integration, applications of the definite integral, improper integrals, functions of several variables, partial derivatives, applications of partial derivatives, multiple integration.						
MTM5162 Calculus B	Ob	72	4	(MTM1132 ou MTM1162 ou MTM5802)	MTM5161 eh	
Vector space. Linear transformations. Change of base. Internal product. Orthogonal transformations. Eigenvalues and eigenvectors of an operator. Diagonalization. Application of linear algebra to science.						
MTM5245 Linear Algebra	Ob	72	4	(MTM1222 ou MTM5812)	MTM5512	



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Phase 03

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Quick survey. Regular survey: the traversal method, the method of decomposing into triangles and methods of rectangular coordinates. UTM coordinate systems. Topographic triangulation. Determining the true meridian.						
ECV5136 Topography I	Ob	54	3	(ECV1121 ou ECV1131 ou ECV1136 ou ECV5131)	(EGR5213 eh EGR5604)	
Introduction to Technical Drawing and instruments, dimensions and scales. Topographical Drawing. Notions of central projection. Architectural Drawing. Design of structures of wood, metal and concrete. Design of Plumbing facilities. Design of Electrical Installations.						
EGR5621 Technical Drawing for Civil Engineering	Ob	72	4	(RTS1621 ou RTS5621)	(EGR5213 eh EGR5604)	
Acoustics, thermology. Assembling and conducting experiments.						
FSC5122 Experimental Physics I	Ob	54	3	(FSC1122 ou FSC1124)	FSC5132	
Electrical Charge. Electric Field. Gauss's Law. Potential. Capacitors. Electric Current. F. E. M. and Circuits. Magnetic Field. Ampere's Law. Faraday's Law. Inductance. Magnetic Properties of Matter. Physical Optics: Interference, Diffraction, Polarization. Quantum Physics. Waves and Particles.						
FSC5133 Theoretical Physics B	Ob	90	5	(FSC1133) ou (FSC1113 eh FSC1114) ou (FSC5113 eh FSC5114)	FSC5132	
Probability theory. Random variables and probability distribution. Main discrete probability distributions. Normal distribution. Other continuous probability distributions. Parameter estimation. Hypothesis testing.						
INE5108 Statistics and Probability for Exacts Sciences	Ob	54	3	(CEC1221 ou CEC5108)	MTM5162	
Noções de cálculo vetorial; integrais curvilíneas e de superfície; teorema de Stokes; teorema da divergência de Gauss; equações diferenciais de 1ª ordem; equações diferenciais lineares de ordem n; noções sobre transformada de Laplace.						
MTM5163 Calculus C	Ob	90	5	(MTM1163 ou MTM5803) ou (MTM1133 eh MTM1134 MTM5162 eh MTM5245))	



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Phase 04

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Identification of the essential conditions for the composition of an architectural project. Organization of architectural spaces with foundations in the modulation and its interrelationship basics. Analysis and development of architectural design in the production of environmental space, involving the relationship indoor / outdoor, indoor / urban as well as the relationship of the building with the city.						
ARQ5115 Architecture I	Ob	72	4	ARQ1115	EGR5621	
Study of equilibrium of particles and rigid bodies (structures, beams, trusses, etc..) In the plane and in space involving the calculation of reactions in standard connections used in engineering and calculation of axial forces, bending moments and shear structures and beams; centroid calculation of areas and volumes of simple figures and composite figures; calculation of moments of inertia of flat plates simple and compound and simple solids and compounds; balancing cables.						
ECV5051 Statics for Civil Engineering	Ob	72	4	FSC5051	(FSC5132 eh MTM5162)	
Leveling. Leveling expedited. Trigonometric Leveling. Tacheometry. Topology. Bathymetry. Design topographical plans.						
ECV5137 Topography II	Ob	36	2	(ECV1121 ou ECV1131 ou ECV1137 ou ECV5131)	(ECV5136 eh EGR5621)	
Fundamental concepts in fluid mechanics, dimensions and units; scalar fields, vector and tensor; viscosity. Hydrostatic; static fluid pressure, manometers, forces on plane and curved submerged surfaces. Analysis outlet; basic laws for systems and control volumes, conservation of mass, the equation of linear momentum, the first law of thermodynamics, Bernoulli equation. Incompressible viscous flow, flow in pipes; Moody diagram, load losses distributed and localized. Fundamental Concepts in heat transmission, dimensions and units; basic laws of heat transfer, conduction, convection and radiation, combined mechanisms of heat transfer. Driving dimensional steady; critical thickness of insulation; fins; composite structures. Molecular diffusion and transport of massa.						
EMC5425 Transport Phenomena	Ob	72	4	EMC1425	FSC5132	
Electrostatics, electromagnetism, electrodynamics and optics. Obtained by assembling and conducting experiments,						
FSC5123 Experimental Physics II	Ob	54	3	FSC1123	(FSC5122 eh FSC5133)	
Kinematic Study of the particles and hard body. Dynamics of particles and rigid body.						
FSC5207 Mechanics II - Dynamics	Ob	54	3	FSC1207	(FSC5132 eh MTM5163)	
Errors and numbering systems. Solution of algebraic and transcendental equations. Solution of polynomial equations. Systems of linear equations and nonlinear. Interpolation curves adjustment. Numerical integration. Numerical solution of ordinary differential equations and systems of differential equations.						
INE5202 Numerical Calculations in Computers	Ob	72	4	(CEC1103 ou CEC5202)	(INE5201 eh MTM5163)	



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Phase 05

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
<p>Conceptions of urban structure in the twentieth century. Comprehensive plans and transportation sector. Methodology of a transportation plan. Quality of transport systems. Specialized transport. Technical and economic aspects of transport modes. Transport in Brazil. Economic viability of road projects.</p>						
ECV5119	Transport Systems	Ob	54	3	ECV1119	ECV5137
<p>General; Aerophotogrammetric; Stereoscopy; Photointerpretation; Understanding remote sensing; stereophotogrammetry; Notions Aerotriangulation; Principles of restitution; Applications topography.</p>						
ECV5143	Photogrammetry and Photo interpretation	Ob	72	4	(ECV1124 ou ECV1143)	ECV5137
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ECV5149	Engineering Geology	Ob	72	4	ECV5139	ECV5137
<p>Stresses and strains in solids subjected to normal stress; simple bending, compound bending normal and oblique shear and torsion; introduction to the mechanical behavior of materials, elastic, inelastic and plastic; verification of safety and design second criterion of allowable stresses, stress analysis : general state of stress, state uniaxial, biaxial and plane stress, state of pure shear; transformation stresses and principal stresses, Mohr's circle.</p>						
ECV5213	Mechanics of Solids I	Ob	72	4	(ECV5215 ou EMC1125) eh (ECV5125)	ECV5051
<p>Introduction; Type of structures; Actions; Support Types; Support Reactions; Static Equilibrium Equations; Degree of Staticity; Internal Forces in Isostatic Structures: -Truss Structures Method of Equilibrium of Joints; Method of Sections (Ritter); Method of Cremona (Graphic) -Beams: Method of Sections, Method of Areas; Direct Method; Compound beams (Gerber) - Plane Frames - Isostatic Grids - Cables - Arches - Influence Lines in Isostatic Structures</p>						
ECV5219	Estrutural Analisys I	Ob	72	4	(ECV1211 ou ECV1217 ou ECV5217)	ECV5051
<p>General properties of materials. Brazilian standards. Materials: natural stones, aggregates, binders, mortars, concrete. Employment of construction materials. Testing laboratories.</p>						
ECV5302	Building Materials I	Ob	72	4	ECV1311	(EQA5114 eh INE5108)
<p>Concept of hydrostatic and hydrodynamic. Conduits under pressure: Load loss formulas: rational and practical: accidental load loss; conduits equivalent; conduits in series and parallel; distribution routes; economic diameter; issue of the three reservoirs. Uniform motion in channels, types of sections, section of least resistance. Orifices, nozzles and spillways. Flow under variable load. Movement in varied channels.</p>						
ENS5101	Hydraulic	Ob	90	5	(ECV1401 ou ENS1101)	EMC5425



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Phase 06

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Origin and formation of soils. Particles. Physical indices. Structure. Plasticity and consistency. Compactness. Classification. Permeability. Percolation. Soil pressures. Compressibility. Exploitation of the subsoil. Laboratory tests.						
ECV5104 Soil Mechanics I	Ob	72	4	ECV1114	ECV5213	
Characteristics of the highways PRE and PRF. Influence of topography on the determination of the most favorable for the implementation of a road. Choose the guideline of a road. Launch shaft. Railing of a highway. Geometric design of a road. Cubação volumes. Points of loans and send-outs. Supervision.						
ECV5115 Geometric Design of Highways	Ob	72	4	ECV1115	ECV5143	
Characteristics of drivers. Traffic characteristics. Capacity and service levels. Entanglement. Ramps. Ttraffic management. Studies of accidents.						
ECV5129 Traffic Engineering	Ob	54	3	ECV1129	ECV5119	
Stress analysis: triaxial stress state, yielding criteria and fracture: Tresca, Von-Mises and Mohr-Coulomb criteria; wall tubes thin subjected to internal pressure and calculation of displacements in structures: direct integration methods, the method of analogy Mohr, principle of virtual work; complementary energy theorems; stability slender pieces subjected to axial compression and eccentric; introduction to solving statically indeterminate structures .						
ECV5214 Mechanics of Solids II	Ob	72	4	(ECV5216 ou EMC1126)	(ECV5213 eh ECV5219 eh FSC5207)	
Introduction. Study materials: concrete and steel reinforced concrete. Simple bending. Shear.						
ECV5261 Concrete Structures I	Ob	72	4	(ECV1237 ou ECV1261)	ECV5219	
General properties of materials. Brazilian Standards. Materials: wood, ceramic, metal, bitumen, plastics, paints and varnishes, glass, rubbers, elastomers, gabions. Laboratory tests.						
ECV5311 Building Materials II	Ob	72	4	ECV1302	(EQA5114 eh INE5108)	
Hydrological cycle. Precipitation. River Basins. Runoff. Evapotranspiration. Infiltration. Groundwater. Hydrograph. Floods. Estimation of flood flows. Reservoir regularization - Storage.						
ENS5102 Hydrology	Ob	72	4	(ECV1402 ou ENS1102 ou ENS5105)	ENS5101	



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Phase 07

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
ECV5114 Soil Mechanics II	Ob	72	4	ECV1104	ECV5104	
ECV5134 Highways' Implementation	Ob	54	3	(ECV1116 ou ECV1134)	(ECV5104 eh ECV5115)	
ECV5220 Structural Analysis II	Ob	72	4	(ECV1212 ou ECV5218)	(ECV5214 eh INE5202)	
ECV5262 Concrete Estruturas II	Ob	72	4	(ECV1238 ou ECV1262)	(ECV5214 eh ECV5261)	
ECV5356 Construction Techniques I	Ob	72	4	(ECV1337 eh ECV1338 eh ECV1351) ou (ECV5351)	(ECV5302 eh ECV5311)	
ECV5357 Construction Techniques II	Ob	72	4	ECV5351	(ECV5302 eh ECV5311)	
ECV5500 Economic and Financial Planning	Ob	54	3	(EPS1211 ou EPS5211)		



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Phase 08

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
ECV5135 Foundations	Ob	54	3	ECV1135	ECV5114	
Overview of Foundations. Survey for the purpose of foundations of structures. Criteria for selection and choose the type of foundation. Shallow foundations: Supportability and Prediction of settlements. Deep Foundations: Bearing capacity and Prediction of settlements. Load tests Foundations. Visits to works.						
ECV5154 Roads' Paving	Ob	72	4	(ECV1127 ou ECV1154)	(ECV5114 eh ECV5119 eh ECV5134)	
Concepts and types of flooring. Studies paving materials. Geotechnical design. Soil stabilization. Design and execution of asphalt pavements. Pavement design polyhedral. Design and implementation of concrete pavement. Conservation and restoration of roads.						
ECV5251 Wood Structures I	Ob	54	3	(ECV1224 ou ECV1251)	ECV5220	
Characteristics of the material from the point of view of the engineer estruturas.Traction axial compression buckling study. Direct shear. The influence of anisotropy in the mechanical resistance of the material. Compression perpendicular to grain. Compression of multiple parts. Simple bending. Oblique bending. Composed bending. Lateral Instability beams. links.						
ECV5255 Metallic Structures I	Ob	54	3	(ECV1223 ou ECV1255)	ECV5220	
Introduction. Traction. Simple bending. Simple compression. Flexion-compression normal and oblique. Connections. Parts flexion straight and oblique. Parts and flexion-compression straight and oblique. Rivets, screws and soldering connections						
ECV5307 Construction's Administration	Ob	72	4	(ECV1324 eh ECV1328)	(ECV5356 eh ECV5357 eh ECV5500)	
Construction management. Implementation of a construction company. Types of contracts. Bids. Specifications, descriptive memorial. Labour taxes applied to construction. Bills of quantities, total costs. Budgeting.Human resources, work processes, productivity and competitiveness.						
ECV5317 Installations I (Plumbing)	Ob	54	3	(ECV1310 ou ECV1317)	(ARQ5115 eh ENS5101 eh FSC5123)	
Projects building facilities of cold water, hot water, sanitary sewer. Fire prevention systems. Exhaustion rain. Gas.						
ECV5319 Installations II (Electrical and telecom)	Ob	54	3	(ECV1319 ou EEL1112)	(ARQ5115 eh ENS5101 eh FSC5123)	
Concept of electric voltage, electric current and electrical power. Electrical conductors. Commands. Plugs. Grounding. Circuit. Breakers. Switchboards. Conduits. Single and three phase power. Telephone facilities.						
ENS5176 Fundamentals of Safety Engineering	Ob	54	3	(ECV1335 ou ECV5335)	(ECV5356 eh ECV5357)	
Conceptualization of safety engineering. Control of the environment. Collective and individual protection. Fire protection. Specific risks in the various qualifications of Engineering. Loss control and productivity. Security in the project. Analysis and accident statistics, selection, training, motivation of staff. Standardization and legislation. Organization of work safety extra-company. Visits.						



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Fase 09

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Introduction to the study of 'Urbanism', assuming that urban development is an iterative process with developments in socio-economic and cultural.						
ARQ515 Urbanism	Ob	54	3	ARQ1515	ECV5143	
Understanding planning. Methodology of planning a project. Construction planning in PERT-CPM. Physical schedule. Physical and financial schedule.						
ECV5318 Planning and Control of Constructions	Ob	72	4	(ECV1318 ou ECV1329) ou (ECV1328 eh ECV1329)	(ECV5356 eh ECV5357)	
Philosophical, social and political work. The Professional system. Professional standards and legislation. Professional fees. Ethics and discipline professional. Forms of professional practice.						
ECV5333 Legislation and Professional Practice	Ob	36	2	(DPS1140 ou ECV1333)		
ECV5511 Completion of Course Work I (TCC)	Ob	18	1	ECV1511		
Water supply systems. Characteristics of the water supply. Stages of project design. Water consumption. Collection, supply and reservation of water. Distribution network. Water treatment. Sewer systems. Sewage network. Wastewater treatment. Network of storm water. Solid waste systems: Cleaning service (storage, collection and transport) and treatment of solid waste (landfill, incineration and composting).						
ENS5106 Sanitation	Ob	72	4	(ENS1106) ou (ECV1405 eh ECV1416)	ENS5101	



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Phase 10

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
ECV5513 Completion of Course Work II (TCC)	Ob	18	1	(ECV1501 ou ECV1512 ou ECV5512)	(ARQ5515 and, ECV5129 and, ECV5135 and, ECV5154 and, ECV5251 and, ECV5255 and, ECV5262 and, ECV5307 and, ECV5317 and, ECV5318 and, ECV5319 and, ECV5327 and, ECV5333 and, ECV5500 and, ECV5511 and, ECZ5102 and, ENS5102 and, ENS5106 and, ENS5176) and,	
ECV5717 Supervised Professional Training	Ob	540	30		(ARQ5515 and, ECV5129 and, ECV5135 and, ECV5154 and, ECV5251 and, ECV5255 and, ECV5262 and, ECV5307 and, ECV5317 and, ECV5318 and, ECV5319 and, ECV5327 and, ECV5333 and, ECV5500 and, ECV5511 and, ECZ5102 and, ENS5102 and, ENS5106 and, ENS5176)	



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Elective Courses

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
Origin of management as a science. Administrative functions: planning, organization, coordination, command and control.						
CAD5103 Management I	Op	72	4	CAD1103		
Goal of economic activity. The Economic System closed. Circulation. The Public Sector. The Economic System open. The financial monetary system. The consumption. National Income. The production unit and the economic system. The distribution of the product in the economic system. Economic fluctuations.						
CNM5105 Introduction to Economics	Op	72	4	(CNM1105 ou CNM5106)		
Concept and Principles of International Trade Law. International Trade Agreements. Connection and autonomy criteria. Enforcement. The pre-contractual stage. Clauses in international contracts. Financial implications.						
DIR5923 International Trade Law	Op	36	2	DPS5113		
Notions of law. Constitution. State. Government. Public Administration. Public officials. Administrative acts. Bids and contracts. Tax System.						
DIR5952 Institutions of Public Law	Op	30	2	DPC5123		
Basics. Classification of tropical and subtropical soils. Use of pedology in estimating geotechnical behavior. Characteristics and engineering properties of laterite and saprolite horizons. Behavior of residual soils of the main Brazilian stones. Rating Compression Tropical - MCT.						
ECV5110 Tropical and Subtropical Soils	Op	54	3		ECV5104	
Economic analysis of the railroads. Infrastructure and superstructure of the permanent way. Scaling of the permanent way, bases, ballasting, gauge, speed guideline. Specific standards. Implementation, maintenance and protection of the permanent way. Traction systems. Signaling. Complementary facilities, courtyards, stations, workshops, etc.. Operation of trains. Efficiency of a railroad.						
ECV5123 Railways	Op	54	3	ECV1123	ECV5134	
Studies, projects and improvement works of inland waterways.						
ECV5125 Sea, Rivers Ports and Channels I	Op	54	3	ECV1125	ENS5102	
Stabilization granulometric.earths lateritic and laterite. Soil-cement. Soil-lime. Soil-lime-fly ash. Soil-bitumen. Chemical stabilization, soil-chloride, phosphoric acid soil. Stabilization of foundation soils, freezing injections in foundations.						
ECV5133 Soil Stabilization	Op	54	3	ECV1133	ECV5114	
Water percolation in soils. Technology soil compaction. Road embankments. Earth dams. Elements of earth works projects.						
ECV5141 Earth Works	Op	54	3	ECV1141	ECV5114	
Application of image interpretation techniques in the preparation of studies and engineering projects.						
ECV5144 Photointerpretation Applied Engineering	Op	36	2	ECV1144	ECV5143	
Location engineering works. Determination of flow of the rivers. Control the stability of buildings. Topography underground. Topography in sanitation. Topography in earthworks..						
ECV5145 Special Topics of Topography	Op	36	2	ECV1145	ECV5143	
Basic concepts of image interpretation: conventional aerial imagery and orbital; Quality of pictures: geometry, radiometry; Regional Planning: a) rural - sectorization of plots, land use, the spatial distribution of forest cover, b) urban - Occupation of the urban versus relief , green areas, city infrastructure, etc.; sampling and aerial photographs; Monitoring regional images by Aeras; Photointerpretation applied to technical records; Join the basis of regional planning.						
ECV5148 Applied photointerpretation to Regional Planning	Op	36	2	(ECV1144 ou ECV1148)	ECV5143	
Mineralogy of soils. Study of clay minerals. Soil formation. The clay-water system; double layer theory clay colloid, osmotic pressure, electrokinetic phenomena (electroosmosis). Soil structure, friction and cohesion of the deflection mechanism. Kinetic process in Soil Mechanics.						
ECV5150 Physic-chemical properties of soils	Op	54	3	ECV1150	ECV5114	
Introduction. Rock and rock mass. Deformability of rocks and rock masses. Strength of the rock mass shear. Methods of drilling rocks. Drilling mechanical, thermal, unconventional methods. Explosives. Disassemble countertops by explosives.						
ECV5152 Rock Mechanics	Op	54	3	ECV1152	ECV5114	



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ECV5153	<p>Introduction. Sampling. Undisturbed sampling techniques. Recording samplers. Recognition of sub-soil surveys. 'In situ' assays, strength and permeability.</p> <p>Sub-Surface Survey</p>	Op	36	2	ECV1153	ECV5114
ECV5155	<p>Conservation: Concept. Causes of failure of pavements. Types of defects. Methods of assessing surface floors. Types of conservation services. Execution of paving services. Maintenance Management System. Restoration: Determination of deflections in the pavement. Resilient modulus of bituminous mixtures and soils. Methods for design of pavement restoration flexible and semi-rigi. Method of Resilience. Practical application and comparative analysis of four methods.</p> <p>Paves Conservation and Restoration</p>	Op	54	3	ECV1155	ECV5154
ECV5157	<p>Introduction. Design of urban structures and movement of people. The process of transportation planning. Establishing goals. Data collection. Trip generation, trip distribution, modal distribution, allocation of trips to the network. Assessment recommended alternative.</p> <p>Planning Urban Transportation</p>	Op	54	3	ECV1157	ECV5119
ECV5159	<p>Systematization and creativity of free choice in technology waterway; standards for preparation of hydrotechnical projects, economy and technology exploitation of water resources; inventory of water potential; characterization of areas of influence of hydrotechnical projects, regional infrastructure, analysis of environmental impacts; script methodological consisting of: prognosis of emergent conditions; environmental management programs..</p> <p>Applied Technology for multiple Water Utilization</p>	Op	54	3	ECV1159	
ECV5160	<p>Understanding General of Civil Aviation. Aircraft characteristics related to the airport project. Air Traffic Control. Planning Airport. Geometric Design of the landing area. Planning of the terminal area. Signaling. Pavement design. Drainage. Impact on the environment.</p> <p>Airports</p>	Op	54	3	ECV1160	ECV5119
ECV5161	<p>Relation of man to his physical environment (Human Requirements). Climatic factors important in the study of this relationship. Basic criteria for drawing the link ARQ X CLIMATE. Thermal Comfort: human demands (comfort zone), forms of heat transfer. Orientation of buildings: sunlight / wind. Control elements of the solar radiation. Natural ventilation of buildings (and function types). Thermal performance of buildings</p> <p>Thermal Performance of Buildings</p>	Op	54	3	ECV1161	(ARQ5115 eh EMC5425)
ECV5222	<p>History. Mechanical characteristics of masonry. Manufacturing sturdy wall. Criteria for calculation and design. pathological problems.</p> <p>Structural Masonry</p>	Op	54	3	ECV1222	(ECV5218 ou ECV5220 eh ECV5311)
ECV5225	<p>.....</p> <p>Análise Computacional de Estruturas</p>	Op	54	3		ECV5220
ECV5230	<p>Qualitative analysis of the functioning of the structures to beams, flat slabs and / or pleated, double slabs, stairs grids, shells, domes, membranes, and plane frames space, arches, trusses and flat space, notions of pre-sizing. Introduction to the design of structures..</p> <p>Qualitative Analysis of Structures</p>	Op	54	3		(FSC5132 eh MTM5162)
ECV5240	<p>Theory errors. Planning Experiments. Instruments: Classification and types. Digital analog conversion. Instruments controlled by computer. Instrument-computer interface. Preparation of specific software for testing. Analysis of results. Transducers and instruments common to civil engineering.</p> <p>Instrumentation and Test in Civil Engineering</p>	Ob	72	4		(ECV5214 ou FSC5123)
ECV5252	<p>Usual types of wooden structures. Development of executives projects: conventional scissors, shears large spans; scissors to cover the stands, truss arch, arch massive; Shed roof type, simply supported bridge; continuous beam bridge, truss bridge beams, portic bridge.</p> <p>Wood Structures II</p>	Op	54	3	(ECV1234 ou ECV1252)	(ECV5220 eh ECV5251)
ECV5256	<p>Scissors. Metal arches. Bearing beams. Structures of industrial buildings. Railway bridge.</p> <p>Steel Structures II</p>	Op	36	2	ECV1256	(ECV5220 eh ECV5255)



COURSE SYLABOUS

Curso: **201 – CIVIL Engineering**

Currículo: **19911**

Habilitation: Civil Engineering

ECV5260	Bridges	Op	90	5	(ECV1250 ou ECV1260)	(ECV5220 eh ECV5262)
Introduction, elements and actions to consider, complete design of a bridge superstructure consists of two main beams, transversianas, curtains and slabs, mesostructure formed by pillars and support equipment; infrastructure foundation directly. Considerations superstructure slab, cellular and Grid.						
ECV5263	Concrete Structures III	Op	72	4	(ECV1239 ou ECV1263)	(ECV5220 eh ECV5262)
Current structures of reinforced concrete. Notions of structures, structure choice. Calculation of slabs, beams, columns and reservoirs. Stairs.						
ECV5264	Concrete Structures IV	Op	54	3	ECV1264	(ECV5220 eh ECV5262)
Special Stairs. Reservoirs. Pools, arches, Vierendell beams, plant curved beams, deep beams.						
ECV5265	Structures Foundations	Op	54	3	(ECV1219 ou ECV1265)	(ECV5135 eh ECV5262)
Foundations, caissons. Stakes. Blocks crowning.						
ECV5266	Prestressed Concrete	Op	54	3	(ECV1220 ou ECV1266)	ECV5262
Introduction. Materials employees. Prestressing systems. Bending. Cracking. Trace of armor. Prestressing losses. Shear. special Topics.						
ECV5308	Works Programming	Op	54	3		ECV5307
Características básicas de gerenciamento e controle da construção. A técnica PERT/CPM (Project Evolution Review Technique/Critical Path Method) através de software. Uso de software aplicado a programação de uma obra de engenharia.						
ECV5315	Special Facilities	Op	36	2	ECV1315	ECV5317
Basic concepts, types characteristic functions of elements and components on physical needs: air conditioning installations, installations of elevators, hoists and escalators. Installation of kitchens, laundries, substations. Facilities compressed air, gas, steam, oxygen and other fluids. Sound systems and communication.						
ECV5332	Engineering Geology	Op	36	2	ECV1332	ECV5134
Groundwater, geology applied to slope stability; Geology roads; Geology of tunnels. foundations of geology; Geology of dams, geology of the state of Santa Catarina.						
ECV5347	Engineering Evaluation	Op	36	2	(ECV1339 ou ECV1347)	
Notions of financial mathematics. Generic plant. Homogenization of values. Evaluation of land allotment. Reviews urbanizavam plots. Evaluation of partially expropriated land. Evaluation tracks easement. Property valuation. Depreciation. Arbitration rents. Evaluation of industrial.						
ECV5348	Engineering Evaluation II	Op	36	2		INE5108
Evaluation of urban properties: methods, value factors. Comparative method of market data: study of variables, data research, survey. Level of rigor of the assessment. Evaluation by statistical inference: regression, correlation, confidence intervals, hypothesis testing, analysis of variance, complementary tests, interval value estimate. Legal experts and preparation of reports.						
ECV5352	Industrialization of Construction	Op	36	2	ECV1352	(ECV5351 ou ECV5356 eh ECV5357)
Purpose. Modern construction techniques. Productivity. Time-Costs. Types of processing and modulation. Assembly. Equipment manufacturing, transportation and lifting. Materials used in the manufacturing of parts. Connecting elements (joints, couplings, connections) advantages and disadvantages. Policy and planning applications for technologically advanced processes.						
ECV5353	Waste Control in Civil Construction	Op	54	3		(ECV5356 eh ECV5357)
History of waste in construction; causes of waste; impact of waste on the costs of buildings, loss indicators, measuring instruments and / or quantification of waste, waste control instruments; guidelines for the implementation of a policy to reduce losses.						
ECV5355	Pathology of Construction	Op	54	3		(ECV5356 eh ECV5357)
Introduction. Concepts. Agents that cause diseases. Pathologies of concrete: reinforcement corrosion, cracking, attack of aggressive agents. Pathologies foundations. Pathology of coatings (mortars, ceramics, painting). Waterproofing problems. Pathologies of the masonry. Analysis of finished structures. Diagnosis. Prevention..						



COURSE SYLABOUS

Curso: **201 – CIVIL Engineering**

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Habilitation: Civil Engineering

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ECV5359	NAVSTAR-GPS system: description, Fundamentals and Applications	Op	36	2	
	Understanding of computer systems, main functions, ways of presenting data. Tools: word processors, spreadsheets, databases, programs, computer aided design (CAD), numerical computation and visualization functions, project managers, network computers, programming languages..				
ECV5360	Computational Tools applied to Civil Engineering	Op	72	4	INE5201
	Introduction. Data formats. Structure and organization of a GIS (Geographic Information System). Input, manipulation and output of a GIS.				
ECV5361	Geoprocessing	Op	54	3	ECV5143
	Introduction. Sensor systems. Spectral behavior of targets. Methods of information extraction. Practical applications.				
ECV5362	Remote Sensing	Op	54	3	ECV5143
	Description of the main GIS software. Use of GIS software. Practical applications.				
ECV5363	Instrumental for Geographic Information Systems	Op	54	3	ECV5143
	Introduction to Sustainability (historical and conceptual analysis of the subject). Methods for assessing the sustainability of buildings (certification systems). Use and land cover (choice of the project site in accordance with sustainability criteria). Building materials and sustainability (concept of embodied energy and life cycle, finishing materials). Sustainable Architecture: energy efficiency, indoor environmental quality, rational use of water, use of renewable resources, waste management. Public policies in Brazil (laws to encourage energy efficiency); Brazilian regulations for voluntary labeling of level of energy efficiency of commercial buildings, public and residential..				
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ECV5364	Sustainability in Buildings	Op	54	3	
	-				
ECV5721	Student Exchange Program I	Op	0	0	
	-				
ECV5722	Student Exchange Program II	Op	0	0	ECV5721
	-				
ECV5731	Student National Exchange I	Op	36	2	
	-				
ECV5732	Student National Exchange II	Op	54	3	
	-				
ECV5733	Student National Exchange III	Op	72	4	
	-				
ECV5741	Student International Exchange I	Op	36	2	
	-				
ECV5742	Student International Exchange II	Op	54	3	
	-				
ECV5743	Student International Exchange III	Op	72	4	
	Introduction to CAD screen work, coordinate input method, command control parameters, commands, file manipulation commands, construction, methods of selecting entities, commands: viewing, editing, dimensioning, text manipulation, buildings elements of architectural drawings..				
EGR5671	Computer Aided Architectural Design	Op	72	4	EGR5621
	Part I: Fundamentals of Fluid Mechanics - eulerian and Lagrangian descriptions of fluid properties. Forces acting. Understanding the kinematics of fluids. Basic equations for conservation of mass, momentum and energy. Application examples. Flow regimes. Understanding flows turbulentos. Parte 2: Study of flow in prismatic channels varied permanent non-erodible: Introduction. Establishment of the basic equation of hydraulic channels: eq. Saint-Venant. Empirical determination of the 'friction' to permanent uniform flow: Chezy and Manning formulas. Critical flow. Qualitative analysis of eq. Basic: classification profiles waterline. Quantitative analysis: numerical method for solution of the equation ('step method), eg'. Study of transitions: specific energy. Hydraulic jumps.				
ENS5103	Hydraulics II	Op	54	3	ENS5101



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Currículo: **19911**

Habilitation: Civil Engineering

Earth's energy balance, atmospheric circulation pattern, synoptic winds. Current: oceanic circulation pattern, the effects of Earth's rotation, stratification of the water and wind action; Astronomical Tide: observed characteristics, forecasting methods; dynamic aspects of the tide. Tidal currents. Meteorological tide. Fundamentals of mechanical waves, wave generation by wind; transformation of waves: refraction, diffraction and surf. Coastal processes: geological aspects, effects of waves on the shore; sediment: soil erosion and siltation of beaches. Engineering works in the coastal region: an overview; environmental implications.

ENS5108 Maritime Hydraulics Op 72 4

Design and planning of urban drainage systems. Hydrological studies and criteria for hydraulic design. Minor drainage systems: rainwater catchment, galleries and small canals. Sizing system macrodrainage: channels, culverts and transitions.

ENS5164 Drenagem Urbana Op 54 3 (ENS5101 eh
ENS5102)

Project hydraulics associated with small dams. Project phases. Classification and selection of dams. Design of structures discharge. Systems design for energy dissipation; moving rapidly varied. Channels under supercritical.

ENS5168 Hydraulics Works Op 54 3 (ECV5114 eh
ENS5101)

Introduction. Fundamental concepts of economics. Theory and production costs. Theory of the firm. Product, income and national expenditure. Global economic balance. Level of employment. Income consumer. Industrial organization. Organizational structure. Principles of organization. Decentralization.

EPS5209 Economics and Industrial Organization Op 54 3 EPS1209 MTM5162

General principles of first aid. Measurements of accidents. Mediate and immediate actions of the rescuer in an emergency and / or urgency. First aid in emergency and / or urgency.

NFR5128 Nursing First Aid Op 36 2 NFR5122



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Habilitation: Civil Engineering

PAM Courses (Electives)

Course	Type	HS	Meet	Equivalency	Prerequisite	Group
<p>Numbers: basic properties, absolute value, inequalities, natural numbers, integers, rational and real. Real functions of a real variable: grapha, limits, continuity, smallest and supreme existence of a maximum of a continuous function on a closed interval. Derivative: differentiation, meaning the derivative, convexity, derived from the inverse function. Integral: Riemann sums, fundamental theorem of calculus. Trigonometric, logarithmic and exponential. Numerical applications. Use of packages.</p>						
MTM5801 H Calculus I	Op	108	6	MTM5161		
<p>Integration techniques. Approximations of functions by polynomials: Taylor's theorem, Lagrange polynomials, splines. Sequences and series. Uniform convergence and power series. Complex functions and series. Numerical applications. Use of packages.</p>						
MTM5802 H Calculus II	Op	108	6	MTM5162	MTM5801	
<p>Coordinate systems: Cartesian, polar, cylindrical, spherical, change of coordinates. Real functions of several variables: grapha, limits, continuity, differentiation, gradient, directional derivative. Vector functions: vector fields, divergence, curl, vector calculus. Higher order derivatives: Taylor theorem, extremes of real functions, Lagrange multipliers, implicit function theorem. Double integrals: integration of different types of regions, changing the order of integration. Use of packages. Numerical applications.</p>						
MTM5803 H Calculus III	Op	108	6	MTM5163	MTM5802	
<p>Triple integral: Change of variables and applications of the integral double and triple. Integration of curves and surfaces. (path integrals, line, surface scalar and vector functions: applications). Integral theorems of vector analysis: theorem of Gauss, Green, Stokes, applications to physics and differential equations. Use of packages. Numerical applications.</p>						
MTM5804 H- Calculus IV	Op	108	6		MTM5803	
<p>Vectors in R2 and R3. Internal product. Vector product in R3. Lines in R2 and R3. Planes in R3. R3 in mixed products. Linear systems. Matrices. Determinants. Use of packages. numerical applications.</p>						
MTM5811 H-Algebra I	Op	108	6	MTM5512		
<p>Vector spaces. Bases and dimension. Linear transformations. Domestic product. Orthonormal bases. QR decomposition. Eigenvalues and eigenvectors of a linear operator. Numerical methods for calculating eigenvalues and eigenvectors. Autoadjuntas matrices and the spectral theorem. Identification of conics and quadrics in R2 in R3. Use of packages. numerical applications.</p>						
MTM5812 H-Algebra II	Op	108	6	MTM5245	MTM5811	
<p>Singular value decomposition. Hessenberg matrices, triangular and band. Canonical forms: Hessenberg Schur and Jordan. QR method. Use of packages. Numerical applications.</p>						
MTM5813 H-Algebra III	Op	108	6		MTM5812	
<p>Euclidean spaces: norms, orthogonality, least squares. Convergence in Euclidean spaces: sequences, series, infinite dimensional bases, Bessel inequality, Parseval equality. General theory of ODE: Existence and uniqueness, Wronskian. Equations with constant coefficients: parameter variation, Green functions, methods simple step and multistep. Laplace Transform (applications to differential equations). Fourier: definitions pointwise convergence and uniform differentiability and integrability of Fourier series, the Weierstrass approximation theorem. Series of orthogonal polynomials (Legendre, Hermite, Laguerre). Boundary problems for ODE: Sturm-Liouville problems, Green's functions. Boundary problems for EDP: wave equation, heat, Laplace. Use of packages. Numerical applications.</p>						
MTM5814 H- Linear Analisis	Op	108	6		MTM5813	
<p>Vector spaces and linear equations. Linear transformations. Orthogonality. Introduction to eigenvalues and eigenvectors.</p>						
MTM5820 H- Linear Algebra II	Op	144	8		MTM5245	



COURSE SYLABUS

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Legend: Type: Ob=Course Obligatory; Op=Course Optional; Es=Estágio(internship); Ex=Extraclass; HS=Class Hour
Equivalent: Course equivalence; Group: Courses that have to be run in Group