UNIVERSIDADE FEDERAL
DE SANTA CATARINA
Pró-Reitoria de Ensino de Graduação
Departamento de Administração Escolar

CURSE 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 Enginner

Period for Curse Competition:	Mínimum: 9 sem.	Máximum: 18 sem.
Hours Required:	UFSC: 4464 HS	CNE: 3600 HS
		Optional: 162 HS
Number of weekly lessons:	Min: 14	Max: 31

Curse Coordinator: Prof. Luis Alberto Gómez
Telephone: +55-48-3721-9420

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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)		
EGR5213	**Representação Gráfica Espacial**	Ob	54	3	EGR5212		
	Introduction to the fundamental concepts of kinematics, dynamics and statics and laws of conservation of energy and linear momentum.						
FSC5101	**Fhysics 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	**Cálculus 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	**Desenho Técnico para Engenharia Civil**	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	**Cálculus 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	**Arquitecture 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
	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.						
ECV5119	**Transport Systems**	Ob	54	3	ECV1119	ECV5137	
	General; Aerophotogrammetric; Stereoscopy; Photointerpretation; Understanding remote sensing; stereophotogrammetry; Notions Aerotriangulation; Principles of restitution; Applications topography.						
ECV5143	**Fotogrametria e Fotointerpretação**	Ob	72	4	(ECV1124 ou ECV1143)	ECV5137	
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ECV5149	**Engineering Geology**	Ob	72	4	ECV5139	ECV5137	
	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.						
ECV5213	**Mechanics of Solids I**	Ob	72	4	(ECV5215 ou EMC1125) eh (ECV5125)	ECV5051	
	Introduction; Type of structures; Actions; Support Types; Support Reactions; Static Equilibrium Equations; Degree of Staticity; Internal Forces in Isostatic Structures: -Truss Structures Method of Equilibrion 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						
ECV5219	**Estrutural AnalisysI**	Ob	72	4	(ECV1211 ou ECV1217 ou ECV5217)	ECV5051	
	General properties of materials. Brazilian standards. Materials: natural stones, aggregates, binders, mortars, concrete. Employment of construction materials. Testing laboratories.						
ECV5302	**Building Materials I**	Ob	72	4	ECV1311	(EQA5114 eh INE5108)	
	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.						
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
	General. Soil compaction. California bearing ratio. Shear Strength of soils. Impuxos land. Retaining walls. Slope Stability. Development and Protection of Work practical tracking work in the field. Lab tests. the compact., bearing ratio California, density 'in sitri' Direct Shear and Compression simple.						
ECV5114	**Soil Mechanics II**	Ob	72	4	ECV1104	ECV5104	
	Design elements in the final implementation of a highway. Final project deployment. Deployment: earthmoving equipment, earthmoving execution, cost composition, measurement forms jogamento and readjustment. Artworks matching of highways and drainage. Works for fixation and protection of highways. Planning and control of highway construction.						
ECV5134	**Highways' Implementation**	Ob	54	3	(ECV1116 ou ECV1134)	(ECV5104 eh ECV5115)	
	Resolution of statically indeterminate structures; method of forces: and matrix algebraic formulation, the displacement method: matrix formulation; particular case. - Cross method.						
ECV5220	**Structural Analysis II**	Ob	72	4	(ECV1212 ou ECV5218)	(ECV5214 eh INE5202)	
	Bending and Normal. Buckling. Simple compression. Bending and oblique. Traction. Slabs. Special Topics: Puncture, contact pressure in a small area.						
ECV5262	**Concrete Structures II**	Ob	72	4	(ECV1238 ou ECV1262)	(ECV5214 eh ECV5261)	
	The Construction Industry in Brazil. The traditional system of Construction. Understanding projects and approvals. Preliminary services. Supply systems. Construction equipment. Transporting materials. Installing the patch. Lease of the work. Foundations. Containment works. Reinforced concrete structure.						
ECV5356	**Construction Techniques I**	Ob	72	4	(ECV1337 eh ECV1338 eh ECV1351) ou (ECV5351)	(ECV5302 eh ECV5311)	
	Masonry sealing and structural. Coatings (argamassados, ceramic, wood, synthetic gypsum, etc..). Painting. Waterproofing. Covers. Thermal and acoustic insulation. Esquadrias. Glasses. Rationalization and industrialization of construction. New techniques and alternative techniques. Understanding performance of buildings. Notions of heavy construction.						
ECV5357	**Construction Techniques II**	Ob	72	4	ECV5351	(ECV5302 eh ECV5311)	
	Interest rates, equivalence relations, debt repayment, economic viability analysis and selection of investments, inflation and monetary correction, developing real estate projects, general accounting principles, basic financial statements, accounting ratios, case study.						
ECV5500	**Economic and Financial Planning**	Ob	54	3	(EPS1211 ou EPS5211)		

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Phase 08

Course		Type	HS	Meet	Equivalency	Prerequisite	Group
	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.						
ECV5135	**Foundations**	Ob	54	3	ECV1135	ECV5114	
	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.						
ECV5154	**Roads' Paving**	Ob	72	4	(ECV1127 ou ECV1154)	(ECV5114 eh ECV5119 eh ECV5134)	
	Characteristics of the material from the point of view of the engineer estrutures.Traçtion 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.						
ECV5251	**Wood Structures I**	Ob	54	3	(ECV1224 ou ECV1251)	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						
ECV5255	**Metalic Structures I**	Ob	54	3	(ECV1223 ou ECV1255)	ECV5220	
	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.						
ECV5307	**Construction's Administration**	Ob	72	4	(ECV1324 eh ECV1328)	(ECV5356 eh ECV5357 eh ECV5500)	
	Projects building facilities of cold water, hot water, sanitary sewer. Fire prevention systems. Exhaustion rain. Gas.						
ECV5317	**Instalations I**	Ob	54	3	(ECV1310 ou ECV1317)	(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.						
ECV5319	**Instalations II**	Ob	54	3	(ECV1319 ou EEL1112)	(ARQ5115 eh ENS5101 eh FSC5123)	
	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.						
ENS5176	**Fundamentals of Safety Engineering**	Ob	54	3	(ECV1335 ou ECV5335)	(ECV5356 eh ECV5357)	

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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.						
ARQ5515	**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 profissionalç. 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
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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,	
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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 granulométrica.Solos 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 photograpHa; 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	**Physico-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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	Introduction. Sampling. Undisturbed sampling techniques. Recording samplers. Recognition of sub-soil surveys. 'In situ' assays, strength and permeability.					
ECV5153	**Sub-Superfice Survey**	Op	36	2	ECV1153	ECV5114
	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.					
ECV5155	**Paves Conservation and Restoration**	Op	54	3	ECV1155	ECV5154
	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.					
ECV5157	**Planning Urban Transportation**	Op	54	3	ECV1157	ECV5119
	Systematization and creativity of free choice in teconologia 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..					
ECV5159	**Applied Technology for multiple Water Utilization**	Op	54	3	ECV1159	
	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.					
ECV5160	**Airports**	Op	54	3	ECV1160	ECV5119
	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					
ECV5161	**Thermal Performance of Buildings**	Op	54	3	ECV1161	(ARQ5115 eh EMC5425)
	History. Mechanical characteristics of masonry. Manufacturing sturdy wall. Criteria for calculation and design. pathological problems.					
ECV5222	**Structural Masonry**	Op	54	3	ECV1222	(ECV5218 ou ECV5220 eh ECV5311)
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ECV5225	**Análise Computacional de Estruturas**	Op	54	3		ECV5220
	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..					
ECV5230	**Qualitative Analysis of Structures**	Op	54	3		(FSC5132 eh MTM5162)
	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.					
ECV5240	**Instrumentation and Test in Civil Engineering**	Ob	72	4		(ECV5214 ou FSC5123)
	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.					
ECV5252	**Wood Structures II**	Op	54	3	(ECV1234 ou ECV1252)	(ECV5220 eh ECV5251)
	Scissors. Metal arches. Bearing beams. Structures of industrial buildings. Railway bridge.					
ECV5256	**Steel Structures II**	Op	36	2	ECV1256	(ECV5220 eh ECV5255)

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	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.					
ECV5260	**Bridges**	Op	90	5	(ECV1250 ou ECV1260)	(ECV5220 eh ECV5262)
	Current structures of reinforced concrete. Notions of structures, structure choice. Calculation of slabs, beams, columns and reservoirs. Stairs.					
ECV5263	**Concrete Structures III**	Op	72	4	(ECV1239 ou ECV1263)	(ECV5220 eh ECV5262)
	Special Stairs. Reservoirs. Pools, arches, Vierendell beams, plant curved beams, deep beams.					
ECV5264	**Concrete Structures IV**	Op	54	3	ECV1264	(ECV5220 eh ECV5262)
	Foundations, caissons. Stakes. Blocks crowning.					
ECV5265	**Structures Foundations**	Op	54	3	(ECV1219 ou ECV1265)	(ECV5135 eh ECV5262)
	Introduction. Materials employees. Prestressing systems. Bending. Cracking. Trace of armor. Prestressing losses. Shear. special Topics.					
ECV5266	**Prestressed Concrete**	Op	54	3	(ECV1220 ou ECV1266)	ECV5262
	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.					
ECV5308	**Works Programming**	Op	54	3		ECV5307
	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.					
ECV5315	**Special Facilities**	Op	36	2	ECV1315	ECV5317
	Groundwater, geology applied to slope stability; Geology roads; Geology of tunnels. foundations of geology: Geology of dams, geology of the state of Santa Catarina.					
ECV5332	**Engineering Geology**	Op	36	2	ECV1332	ECV5134
	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.					
ECV5347	**Engineering Evaluation**	Op	36	2	(ECV1339 ou ECV1347)	
	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.					
ECV5348	**Engineering Evaluation II**	Op	36	2		INE5108
	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.					
ECV5352	**Industrialization of Construction**	Op	36	2	ECV1352	(ECV5351 ou 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.					
ECV5353	**Waste Control in Civil 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..					
ECV5355	**Pathology of Construction**	Op	54	3		(ECV5356 eh ECV5357)

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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 Engeneering**	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 Infomation 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..					
ECV5364	**Sustainability in Buildings**	Op	54	3		
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ECV5721	**Student Exchange Program I**	Op	0	0		
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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	**Desenho Arquitetônico com Auxilio do Computador**	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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	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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PAM Courses (Electives)

Course		Type	HS	Meet	Equivalency	Prerequisite	Group
	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.						
MTM5801	**H Calculus I**	Op	108	6	MTM5161		
	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.						
MTM5802	**H Calculus II**	Op	108	6	MTM5162	MTM5801	
	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.						
MTM5803	**H Calculus III**	Op	108	6	MTM5163	MTM5802	
	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.						
MTM5804	**H- Calculus IV**	Op	108	6		MTM5803	
	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.						
MTM5811	**H-Algebra I**	Op	108	6	MTM5512		
	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.						
MTM5812	**H-Algebra II**	Op	108	6	MTM5245	MTM5811	
	Singular value decomposition. Hessenberg matrices, triangular and band. Canonical forms: Hessenberg Schur and Jordan. QR method. Use of packages. Numerical applications.						
MTM5813	**H-Algebra III**	Op	108	6		MTM5812	
	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.						
MTM5814	**H- Linear Analisys**	Op	108	6		MTM5813	
	Vector spaces and linear equations. Linear transformations. Orthogonality. Introduction to eigenvalues and eigenvectors.						
MTM5820	**H- Linear Algebra II**	Op	144	8		MTM5245	

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Legend: Type: Ob=Course Obrigatory; Op=Course Optional; Es=Estágio; Ex=Extraclass; HS=Class Hour Equivalent: Course equivalente; Group: Courses that have to be run in Group