



FICHA DE UNIDADE CURRICULAR

Unidade Curricular

202299302 - Gramáticas de Forma

Tipo

Optativa

Ano lectivo

2022/23

Curso

Doutoramento Arquitetura

Ciclo de estudos

3º

Créditos

5.00 ECTS

Idiomas

Português ,Inglês

Periodicidade

semestral

Pré requisitos

Ano Curricular / Semestre

Área Disciplinar

Desenho, Geometria e Computação

Horas de contacto (semanais)

Teóricas	Práticas	Teórico práticas	Laboratoriais	Seminários	Tutoriais	Outras	Total
0.00	0.00	1.50	0.00	0.00	0.00	0.00	1.50

Total Horas da UC (Semestrais)

Total Horas de Contacto
21.00

Horas totais de Trabalho
42.00

Docente responsável (nome / carga lectiva semanal)

Luís António dos Santos Romão

Outros Docentes (nome / carga lectiva semanal)

Luís António dos Santos Romão 3.00 horas

Objetivos de aprendizagem (conhecimentos, aptidões e competências a desenvolver pelos estudantes)

Esta disciplina tem como objetivos concretos: (1) Introduzir um processo de apoio à conceção usando um processo computacional e generativo, nas componentes teóricas e práticas; (2) Introduzir o paradigma de um processo computacional que se caracteriza por ser o primeiro, e o único, a introduzir a dimensão visual; (3) Fornecer meios estruturados de análise e de síntese quer

para a compreensão das linguagens de projetos existentes quer explorar novas linguagens para definir novos projetos.

Conteúdos Programáticos / Programa

- (1) Introdução às gramáticas da forma: teoria e aplicações em arquitetura, urbanismo e design;
- (2) As gramáticas da forma no ensino e na prática do projecto;
- (3) Conceitos I: Forma, forma analítica, computação da forma, transformações no espaço Euclidiano, álgebras;
- (4) Conceitos II: Relação espacial, regra, rótulos, derivação, recursão, parametrização;
- (5) Conceitos III: Transformações estilísticas;
- (6) Conceitos IV: Categorização das Gramáticas da Forma;
- (7) Conceitos V: Gramáticas de cor e de pesos;
- (8) Conceitos VI: Gramáticas compostas;
- (9) Conceitos VII: Gramáticas descritivas;
- (10) Aplicações I: gramática das Vilas de Palladio e outras
- (11) Aplicações II: Exemplos aplicados em arquitetura, urbanismo e design;
- (12) Aplicações III: Críticas à teoria, analogias com as gramáticas de Chomsky e à máquina de Turing;
- (13) Aplicações IV: Interpretadores de gramáticas da forma.

As aulas serão suportadas por leituras de artigos que apoiam cada tema por aula e pela realização de pequenos trabalhos práticos.

Demonstração da coerência dos conteúdos programáticos com os objectivos de aprendizagem da unidade curricular

Fornecer ao aluno instrumentos teóricos e práticos que lhe permita a compreensão e a descrição da forma de acordo com os princípios generativos das gramáticas, os quais poderão, ou não, ser traduzidos posteriormente para uma linguagem de programação. Entende-se por gramáticas da forma um sistema lógico e visual que permite descrever a forma nas suas diferentes significações.

Metodologias de ensino (avaliação incluída)

1. Leituras (50% Da Nota Final): O Primeiro Trabalho É Uma Coletânea De Mini Textos (1/2 A1) com um comentário crítico c cada um dos Temas/Textos que vão sendo tratados semanalmente. 2. Trabalho Final (50% da nota final) a escolher pelo aluno com o acordo do docente, entre as duas alternativas seguintes:
 - 2.1 Ensaio teórico sobre um tema particular do universo das gramáticas da forma;
 - 2.2. Esboço ou Implementação Informática de uma gramática, a partir dos atuais ou novos projectos.

Demonstração da coerência das metodologias de ensino com os objectivos de aprendizagem da unidade curricular

Esta UC tem carácter teórico-prático pelo que só a leitura sistemática e a exibição prática permite a compreensão da matéria em questão.

Bibliografia Principal

Stiny, G., Shape: Talking about seeing and doing. 2006, Cambridge, Mass.: MIT Press.

Bibliografia Complementar

Chau, H. H. (2004) Evaluation of a 3D Shape Grammar Implementation. Design Computation and Cognition '04, JS Gero (Ed.), pp.357-376. Chomsky N. (1957) Syntactic Structures. The Hague: Mouton. Reprint. Berlin and New York (1985). Duarte, J. P. (2005) A Discursive Grammar for Customizing Mass Housing: the case of Siza's houses at Malagueira. Automation in Construction, 14(2), pp.265-275, Elsevier Science. Fleisher, A. (1992) Grammatical architecture?. Environment and Planning B: Planning and Design, 19, pp.221-226. Koning, H., and Eisenberg, J. (1981) The language of the prairie: Frank Lloyd Wright's prairie houses. Environment and Planning B: Planning and Design, 8, pp.295-323. Li, Andrew I-kang (2001) Teaching style grammatically, with an example from traditional Chinese architecture. In The proceedings of Mathematics & design 2001: the third international conference (3-5 July 2001, Geelong, Australia), pp.270-277. Knight, T. W. (1989) Shape Grammars in Education and Practice: History and Prospects. Internet Paper. <http://www.mit.edu/~tknight/IJDC/> Knight, T. W. (1989) Color grammars: designing with lines and colors. Environment and Planning B: Planning and Design, 16, pp.417-449. Knight, T. W. (1989) Transformations of De Stijl art: the paintings of Georges Vantongerloo and Fritz Glarner. Environment and Planning B: Planning and Design, 16, pp.51-98. Knight, T. W. (1993) Color Grammars: the Representation of Form and Color in Design. Leonardo, 26, pp.117-124. Stiny G., and Gips J. (1972) Shape Grammars and the Generative Specification of Painting and Sculpture. C V Freiman (ed) Information Processing 71 (Amsterdam: North-Holland) 1460-1465. Republished in Petrocelli O R (ed) 1972 The Best Computer Papers of 1971: Auerbach, Philadelphia pp.125-135. Stiny, G. (1976) Two exercises in formal composition. Environment and Planning B: Planning and Design, 3(2), pp.187-210. Stiny, G. and Mitchell, W. J. (1978) The Palladian grammar. Environment and Planning B: Planning and Design, 5, pp.5-18. Stiny, G. and Mitchell, W. J. (1980) The grammar of paradise: on the generation of Mughul gardens, Environment and Planning B: Planning and Design, 7, pp.209-226. Stiny, G. (1980) Kindergarten grammars: designing with Froebel's building gifts. Environment and Planning B: Planning and Design, 3, pp.461. Stiny, G. (1980) Introduction to shape and shape grammars. Environment and Planning B: Planning and Design, 7(3), pp.343-351. Stiny, G. (1990) What is a design?. Environment and Planning B: Planning and Design, 17, pp.97-103. Stiny, G. (1992) Weights. Environment and Planning B: Planning and Design, 19, pp.413-430. Turing, A. (1936) On Computable Numbers, With an Application to the Entscheidungsproblem, Proceedings of the London Mathematical Society, 42 (2).



CURRICULAR UNIT FORM

Curricular Unit Name

202299302 - Shape Grammars

Type

Elective

Academic year

2022/23

Degree

Phd Architecture

Cycle of studies

3

Unit credits

5.00 ECTS

Lecture language

Portuguese ,English

Periodicity

semester

Prerequisites

Year of study/ Semester

Scientific area

Drawing, Geometry and Computation

Contact hours (weekly)

Tehoretical	Practical	Theoretical-practicals	Laboratory	Seminars	Tutorial	Other	Total
0.00	0.00	1.50	0.00	0.00	0.00	0.00	1.50

Total CU hours (semester)

Total Contact Hours

21.00

Total workload

42.00

Responsible teacher (name /weekly teaching load)

Luís António dos Santos Romão

Other teaching staff (name /weekly teaching load)

Luís António dos Santos Romão 3.00 horas

Learning objectives (knowledge, skills and competences to be developed by students)

This course aims to: (1) Introduce a process to support design using a generative computational process in their theoretical and practical components; (2) Introduce the paradigm of a computational process that takes into account visual aspects, which is the only one to do so comprehensively; (3) Provide a structured means to analyze and synthesize shape both for understanding existing design languages and for exploring new ones.

Syllabus

- (1) Introduction to shape grammars: theory and applications in architecture, urbanism and design;
- (2) Shape grammars in education and practice;
- (3) Concepts I: Form, shape analysis, shape computation, transformations in Euclidean space, algebras;
- (4) Concepts II: Spatial relations, rules, labels, derivation, recursion, parameterization;
- (5) Concepts III: Stylistic transformations;
- (6) Concepts IV: Shape Grammars classifications;
- (7) Concepts V: Colour and weight grammars;
- (8) Concepts VI: Compound grammars;
- (9) Concepts VII: Descriptive grammars;
- (10) Applications I: Palladio grammar and others foundational ones;
- (11) Applications II: Applied examples in architecture, urbanism and design;
- (12) Applications III: Critics of the theory, analogies with Chomsky grammars and Turing machine;
- (13) Applications IV: shape grammars interpreters.

Classes will be supported by readings and of small practical exercises on selected themes in a weekly base.

Demonstration of the syllabus coherence with the curricular unit's learning objectives

Provide students with theoretical and practical tools that allow the understanding and description of shape according to the generative principles of grammars, which can later be, or not, translated into a programming language. It is understood by shape grammars a logical system for describing visual form in its different meanings.

Teaching methodologies (including evaluation)

1. Readings (50% of Final Grade): The first work is a collection of mini texts (1/2 of A4 page) with a critical commentary on each of the texts read weekly.
2. Final Work (50% of Final Grade): To choose cb the student with the agreement of the teacher, between the following two alternatives:
 - 2.1 Theoretical essay on a particular theme from the universe of Shape Grammars;
 - 2.2. Sketch or a computer implementation of an analytic or synthetic grammar from an existent or a new project.

Demonstration of the coherence between the Teaching methodologies and the learning outcomes

This UC has a theoretical-practical character, so that only systematic reading and practical exhibition allows the understanding of the subject in question.

Main Bibliography

Stiny, G., Shape: Talking about seeing and doing. 2006, Cambridge, Mass.: MIT Press.

Additional Bibliography

Chau, H. H. (2004) Evaluation of a 3D Shape Grammar Implementation. Design Computation and Cognition '04, JS Gero (Ed.), pp.357-376. Chomsky N. (1957) Syntactic Structures. The Hague: Mouton. Reprint. Berlin and New York (1985). Duarte, J. P. (2005) A Discursive Grammar for Customizing Mass Housing: the case of Siza's houses at Malagueira. Automation in Construction, 14(2), pp.265-275, Elsevier Science. Fleisher, A. (1992) Grammatical architecture?. Environment and Planning B: Planning and Design, 19, pp.221-226. Koning, H., and Eisenberg, J. (1981) The language of the prairie: Frank Lloyd Wright's prairie houses. Environment and Planning B: Planning and Design, 8, pp.295-323. Li, Andrew I-kang (2001) Teaching style grammatically, with an example from traditional Chinese architecture. In The proceedings of Mathematics & design 2001: the third international conference (3-5 July 2001, Geelong, Australia), pp.270-277. Knight, T. W. (1989) Shape Grammars in Education and Practice: History and Prospects. Internet Paper. <http://www.mit.edu/~tknight/IJDC/> Knight, T. W. (1989) Color grammars: designing with lines and colors. Environment and Planning B: Planning and Design, 16, pp.417-449. Knight, T. W. (1989) Transformations of De Stijl art: the paintings of Georges Vantongerloo and Fritz Glarner. Environment and Planning B: Planning and Design, 16, pp.51-98. Knight, T. W. (1993) Color Grammars: the Representation of Form and Color in Design. Leonardo, 26, pp.117-124. Stiny G., and Gips J. (1972) Shape Grammars and the Generative Specification of Painting and Sculpture. C V Freiman (ed) Information Processing 71 (Amsterdam: North-Holland) 1460-1465. Republished in Petrocelli O R (ed) 1972 The Best Computer Papers of 1971: Auerbach, Philadelphia pp.125-135. Stiny, G. (1976) Two exercises in formal composition. Environment and Planning B: Planning and Design, 3(2), pp.187-210. Stiny, G. and Mitchell, W. J. (1978) The Palladian grammar. Environment and Planning B: Planning and Design, 5, pp.5-18. Stiny, G. and Mitchell, W. J. (1980) The grammar of paradise: on the generation of Mughul gardens, Environment and Planning B: Planning and Design, 7, pp.209-226. Stiny, G. (1980) Kindergarten grammars: designing with Froebel's building gifts. Environment and Planning B: Planning and Design, 3, pp.461. Stiny, G. (1980) Introduction to shape and shape grammars. Environment and Planning B: Planning and Design, 7(3), pp.343-351. Stiny, G. (1990) What is a design?. Environment and Planning B: Planning and Design, 17, pp.97-103. Stiny, G. (1992) Weights. Environment and Planning B: Planning and Design, 19, pp.413-430. Turing, A. (1936) On Computable Numbers, With an Application to the Entscheidungsproblem, Proceedings of the London Mathematical Society, 42 (2).