FACULDADE DE ARQUITECTURA
UNIVERSIDADE DE LISBOA

FICHA DE UNIDADE CURRICULAR

Código:	Gramáticas da Forma e História da Computação na Arquitectura -3C	Tipo de Unidade Curricular
001340000		Optativa
Ano Lectivo	Curso:	Ciclo Estudos:
2017-2018	Vários CDA, CEA-CAAUD	1º ☐ 2º ☐ 3º ☒
Créditos:	Idioma leccionado	Ano Curricular:
10,0 ECTS	☒ Português ☒ Inglês ☐ Outro idioma	1º ☒ 2º ☐ 3º ☐ 4º ☐ 5º ☐
Área Científica:		Anual: ☐ Semestral: 1º ☒ 2º ☐
☒ Arq.ª ☒ Urb.º ☒ Design ☒ DCV ☐ CST ☐ TAUD ☐ HTAUD		
Pré-requisitos: Sim ☐ Não ☒	Não existem pré-requisitos para esta unidade curricular	Trimestral: 1º ☐ 2º ☐ 3º ☐

Docente(s) Responsável(eis) pela U.C.

Luís Romão		
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Docente(s) da U.C.

Luís Romão		
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Jorge Ribeiro		
Professor Auxiliar	Email:	URL:
João Rocha		
Professor Auxiliar	Email:	URL:
Categoria:	Email:	URL:

Horas de Contacto:

Teóricas:	Práticas:	Teórico-Práticas:	Laboratoriais:	Seminários:	Tutoriais:	Outras:	Total Horas de Contacto:
0,0 H	0,0 H	42,0 H	0,0	0,0	0,0	0,0	42,0 Horas

Estimativa de Horas Totais de Trabalho:

Inclui o total de horas de contacto mais as horas extra dedicadas à unidade curricular. Horas Totais de Trabalho: 280,0 Horas

Objectivos (tópicos) limite 900 caracteres

Esta disciplina tem como objetivos concretos:

(1) Introduzir um processo de apoio à conceção usando um processo computacional, ou generativo, nas suas componentes teóricas e práticas;

(2) Introduzir o paradigma de um processo computacional que se caracteriza por ser o primeiro a introduzir uma dimensão visual e que atualmente continua a ser o único a fazê-lo;

(3) Fornecer meios estruturados de análise e de síntese quer para compreender linguagens de projeto actuais quer para explorar novas linguagens.

(4) Enquadrar o conhecimento computacional na história da arquitectura, das artes e das ciências para melhor compreender as propostas actuais.

(5) Sensibilizar e desenvolver a consciência para a necessidade do conhecimento e utilização de modelos de otimização geométrica e topológica, bem como ferramentas de design automático e interativo.

Conteúdos Programáticos / Programa limite 1500 caracteres

(1) Introdução às gramáticas da forma: teoria e aplicações em arquitetura, urbanismo e design, (LR);

(2) Fisica e Arte: As novas Leis da criatividade. Avant-Garde: Artistas e Cientistas um novo paradigma, (JR);

(3) Refugiados de Guerra em Londres: Ulm, Bahuaus e Circle. Guernica e a II Guerra Mundial, (JR);

(4) Pós Guerra: A figura pioneira de Desmond Bernal. Alan Turing e Bletchley Park: Computação analógica e computação digital. Computação comercial IBM e Olivetti, (JR);

(5) Computação e Design: Serge Chermayeff, Christopher Alexander e Lionel March. Os primeiros Centros de Investigação: LUBFS e Architecture Machine Group, (JR);

(6) Algebra I Cálculo Vectorial, Cálculo Matricial e Transformações Lineares, (JRb);

(7) Algebra II Teoria dos Grafos; Modelos de otimização geométrica e topológica, (JRb);

(8) Forma, forma analítica, computação da forma, transformações no espaço Euclidiano, álgebras;

Relação espacial, regra, rótulos, derivação, recursão, parametrização, (LR);

(9) Gramáticas de cor e de pesos; Gramáticas compostas; Gramáticas descritivas, (LR);

(10) Transformações estilísticas, (LR);

(11) Interpretadores de gramáticas 2D e 3D, (LR);

(12) As gramáticas de forma no ensino e na profissão; Aplicações em arquitetura, urbanismo e design, (LR);

(13) Apoio ao trabalho dos alunos, (LR), (JR), (JRb);

(14) Apresentação do trabalho dos alunos, (LR), (JR), (JRb);

(FAs aulas serão suportadas por leituras de artigos que desenvolvem particularmente cada tema e pela realização de trabalhos práticos.)

Competências a adquirir pelo discente (tópicos) limite 3000 caracteres

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 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.

Abordagem de resolução de um problema aplicando noções topológicas e raciocínio lógico e pragmático.

Apresentar os contextos tecnológicos, políticos, culturais e sociais que favoreceram o aparecimento dos primeiros centros de pesquisa realacionados com computação em arquitectura;

Apresentar as principais diferenças ideológicas, teóricas e computacionais que cada Centro desenvolveu contribuindo para a formação de um novo campo disciplinar.

Bibliografia Principal limite 3000 caracteres

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

Bibliografia Complementar limite 3000 caracteres

- 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.
- Michalek, J.J.; Choudhary, R.; Papalambros, Panos Y. (2002). Architectural Layout Design Optimization. Engineering Optimization, vol.34(5), 461-484.
- Neves, I.; Rocha, J.; Duarte, J. (2013) The legacy of the Hochchule Fur Gestaltung of Ulm in Computational design research in arqcitecture. R. Stouffs, P. Janssen, S. Roudavski, B. Tunçer (eds.), Open Systems: Proceedings of the 18th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA), 293–302. Hong Kong, and Center for Advanced Studies in Architecture (CASA), Department of Architecture, ISBN:9789881902641. Singapore.
- Neves, I.; Rocha, J.; Duarte, J. (2014) Design Research in Architecture: The Legacy of the Hochschule für Gestaltung International. In, International Journal of Architectural Computing. Issue I Volume 12. pp: 2-25. ISSN: 1478-0771. D.O.I: 10.1260/1478-0771.12.1.1 Multi Science Publishing, London.
- Rocha, J.; Duarte, J., Soares, G. D. (2017) Unveiling the Structure of the Marrakech Medina: A shape grammar and an interpreter for generating urban form. Artifical Design for Engeneering Design Anaysis and Manufacturing. 21. Pp: 317-349. Cambridge University Press.
- 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 com

Avaliação (elementos e critérios) limite 900 caracteres

1. Trabalho Final: A Escolher Pelo Aluno Com O Acordo Do Docente, Entre As Duas Alternativas Seguintes:

1.1 Ensaio Teórico Sobre Um Tema Particular Do Universo Das Gramáticas Da Forma, História Da Computação Em Arquitectura;

2.2. Esboço De Uma Gramática Analítica Ou Sintética

Data de actualização

Última actualização em: quinta-feira, 22 de junho de 2017

FACULDADE DE ARQUITECTURA
UNIVERSIDADE DE LISBOA

CURRICULAR UNIT FORM

Code:	Shape Grammars And History Of Computation In Architecture - 3C	Curricular Unit Type
001340000		Elective
Academic Year	Degree:	Cycle of Studies:
2017-2018	Select a Degree CDA, CEA-CAAUD	1º ☐ 2º ☐ ☒
Unit Credits:	Lecture Language	Curricular Year:
10,0 ECTS	☒ Portuguese ☒ English ☐ Specify Other language	1º ☒ 2º ☐ 3º ☐ 4º ☐ 5º ☐
Scientific Area:		Annual: ☐ / Semester: 1º ☒ 2º ☐
☒ Archit. ☒ Urban. Pl ☒ Design ☒ DCV ☐ CST ☐ TAUD ☐ HTAUD		
Prerequisites: Yes ☐ No ☒	There are no prerequisites for this curricular unit	Trimester: 1º ☐ 2º ☐ 3º ☐

Responsible Professor(s)

Luís Romão		
Assistant Professor	Email: lromao@fa.ulisboa.pt	URL: www.fa.ulisboa.pt/~lromao
José P. Duarte		
Full Professor	Email: jduarte@fa.ulisboa.pt	URL: www.fa.ulisboa.pt/~jduarte

Lecture(s)

Luís Romão		
Assistant Professor	Email: lromao@fa.ulisboa.pt	URL: www.fa.ulisboa.pt/~lromao
Jorge Ribeiro		
Assistant Professor	Email:	URL:
Rank:	Email:	URL:
Rank:	Email:	URL:

Contact Hours:

Lectures:	Practical:	Lectures-Practical:	Laboratory:	Seminary:	Tutorials:	Others:	Total Contact Hours:
0,0 H	0,0 H	42,0 H	0,0 H	0,0H	0,0 H	0,0 H	42,0 Hours

Estimated Workload

Includes the total contact hours plus overtime devoted to the course unit

Total Workload: 280,0 Hours

Goals (topics) limit 900 characters

This discipline has the following goals:

(1) Introducing a design support procedure using a computational method, (or generative,) in its theoretical and practical components;

(2) Introducing the paradigm of a computational process that is characterized by being the first to introduce a visual dimension and which, currently remains the only one to do so;

(3) Providing structured means of analysis and synthesis both to understand current design languages and to explore new languages;

(4) Framing computational knowledge in the history of architecture, arts and sciences to better understand current proposals;

(5) Raise and developing awareness for the need for knowledge of geometric and topological optimization models as well as automatic and interactive design tools.

Programmatic contents / Programme limit 1500 characters

(1) Introduction to shape grammars: theory and applications in architecture, urbanism and design, (LR);

(2) Physics and Art: The new Laws of creativity. Avant-Garde: Artists and Scientists a new paradigm, (JR);

(3) War Refugees in London: Ulm, Bahuaus and Circle. Guernica and World War II, (JR);

(4) Post War: The pioneering figure of Desmond Bernal. Alan Turing and Bletchley Park: Analog computing and digital computing. IBM and Olivetti commercial computing, (JR);

(5) Computing and Design: Serge Chermayeff, Christopher Alexander and Lionel March. The first Research Centers: LUBFS and Architecture Machine Group, (JR);

(6) Algebra I: Vector Calculation, Matrix Calculation and Linear Transformations, (JRb);

(7) Algebra II: Theory of Graphs; Geometric and topological optimization models, (JRb);

(8) Form, analytical form, computation of form, transformations in Euclidean space, algebras, (LR);

Spatial relation, rule, labels, derivation, recursion, parametrization, (LR);

(9) Color and weight grammars; Compound Grammars; Descriptive Grammars, (LR);

(10) Stylistic transformations, (LR);

(11) Interpreters of 2D and 3D grammars, (LR);

(12) Shape Grammars in academia and profession; Applications in architecture, urbanism and design

(13) Support student work, (LR), (JR), (JRb);

(14) Presentation of students' work, (LR), (JR), (JRb);

Competencies to be acquired by students (topics) limit 3000 characters

Providing student with theoretical and practical tools that allow him to understand and describe the shape according to the generative principles of the grammar, which can (or not) later be translated into a programming language. Shape Grammars are understood as a logical and visual system that allows to describe the form in its different meanings.

Approaching to solve problems by applying topological notions and logical and pragmatic reasoning. Presenting technological, political, cultural and social contexts that favored the appearance of the first research centers related to architecture computation;

Presenting the main ideological, theoretical and computational differences that each Center has developed contributing to the formation of a new disciplinary field.1. Final work: to be chosen by the student with the teacher's agreement, between the following two alternatives:

1.1 Theoretical essay on a particular theme from the universe of Shape Grammars or History of Computation in Architecture;

1.2. A sketch of an analytical or synthetic grammar.

Main Bibliography limit 3000 characters

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

Additional Bibliography limit 3000 characters

- Chau, H. H. (2004) Evaluation of a 3D Shape Grammar Implementation. Design Computation and Cognition '04, JS Gero (Ed.), pp.357-376.
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- Stiny, G. (1976) Two exercises in formal com

Assessment limit 900 characters

1. Final Work: To Be Chosen By The Student With The Teacher's Agreement, Between The Following Two Alternatives:

1.1 Theoretical Essay On A Particular Theme From The Universe Of Shape Grammars Or History Of Computation In Architecture;

1.2. A Sketch Of An Analytical Or Synthetic Grammar.

(Classes will be supported by weekly readings of papers that develop a particular theme and by the accomplishment of practical works.)

Last updated

Last updated on: Thursday, 22 June 2017