



Teaching Guide

| Teaching Guide | | | | |
|--------------------------|--|--------|---|-----------|
| Identifying Data | | | | 2020/21 |
| Subject (*) | Computational fluid dynamics I | | Code | 632844205 |
| Study programme | Mestrado Universitario en Enxeñaría da Auga (plan 2012) | | | |
| Descriptors | | | | |
| Cycle | Period | Year | Type | Credits |
| Official Master's Degree | 1st four-month period | First | Optional | 6 |
| Language | English | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Enxeñaría CivilMatemáticas | | | |
| Coordinador | Rodríguez-Vellando Fernández-Carvajal, Pablo | E-mail | pablo.rodriguez-vellando@udc.es | |
| Lecturers | Fe Marques, Jaime Naves García-Rendueles, Acacia Rodríguez-Vellando Fernández-Carvajal, Pablo | E-mail | jaime.fe@udc.es acacia.naves@udc.es pablo.rodriguez-vellando@udc.es | |
| Web | caminos.udc.es/hosting/masteragua/ | | | |
| General description | Fundamentals of open channel flow and computational fluid dynamics. Fundamental equations: Saint-Venant, Navier-Stokes, potential flow, stream-vorticity, Stokes flow, shallow water, convection-diffusion, Darcy,... Fundamentals of Matlab programming. Finite element programming of hydrodynamic, porous media and geochemical models. Introduction to Finite Volumes. | | | |
| Contingency plan | 1 Modifications to contents WITHOUT CHANGES 2 Methodologies ? Teaching methodologies that are maintained ANY NOT SPECIFIED BELOW ? Teaching methodologies that are modified THE CLASSES WILL BE TAUGHT IN ?TEAMS? WITH SUPPORT IN MOODLE AND PVELLANDO@UDC.ES. 3 Mechanisms for personalized attention to or students TEAMS: REGULAR HOURS OF CLASS AND PERSONALIZED TUTORIALS ON DEMAND MOODLE: ADDITIONAL DOCUMENTATION AND WEEKLY REVIEWS OF THE EXPOSED CONTENTS IN TEAMS PVELLANDO@UDC.ES: ON DEMAND 4. Modifications under evaluation The weighting of the final grade and the submission of courseworks would be done electronically and would not have any modifications. 5 Modifications of the bibliography or webgraphy WITHOUT MODIFICATIONS | | | |

Study programme competences

| Code | Study programme competences |
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Learning outcomes

| Learning outcomes | Study programme competences |
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| Ability to apply the fluid mechanics and the fundamental equations of flow calculation pressure pipes and sheet free. | A1 | B1 | C1 |
| Understanding the basics of computational fluid dynamics (CFD). Ability to develop codes that solve incompressible flow both | A1 | B1 | C1 |
| free surface and porous medium. Knowledge of numerical models applied to hydraulic engineering. Capacity use and analyze | A1 | B1 | C1 |
| the results of a hydraulic model. Ability to design, develop and analyze numerical schemes used in a hydraulic model. | A1 | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
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| Contents | |
|--|--|
| Topic | Sub-topic |
| Fundamentals of Open Channel flow (revision) | Open Channel flow |
| Fundamentals of Computational Fluid Dynamics | Computational Fluid Dynamics |
| Governing equations | Saint-Venant Navier-Stokes Potential flow Stream-vorticity Stokes flow Shallow water Convection-diffusion Darcy,... |
| Fundamentals of Matlab programming | Matlab programming |
| Finite Element programming of fluid models | Hydrodynamic models Porous media models Geochemical models |
| Fundamentals of Finite Volumes programming | Finite Volumes programming |
| Comercial programmes | Comercial programmes |

| Planning | | | | |
|-----------------------|--|----------------------|-------------------------------|-------------|
| Methodologies / tests | Competencies | Ordinary class hours | Student?s personal work hours | Total hours |
| Seminar | A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8 | 30 | 30 | 60 |



| | | | | |
|---|--|----|----|----|
| Guest lecture / keynote speech | A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8 | 30 | 30 | 60 |
| Personalized attention | | 30 | 0 | 30 |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. | | | | |

| Methodologies | |
|--------------------------------|--|
| Methodologies | Description |
| Seminar | Practical lectures related to the theoretical aspects regarded at the magistral lectures |
| Guest lecture / keynote speech | Regular lectures where the main theoretical contents of the subjects are regarded |

| Personalized attention | |
|------------------------|--|
| Methodologies | Description |
| Seminar | Personalized attention to be provided for the seminars |

| Assessment | | | |
|--------------------------------|--|--|---------------|
| Methodologies | Competencies | Description | Qualification |
| Guest lecture / keynote speech | A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8 | The knowledge of the concepts developed at the magistral lectures will be assessed and considered for the final mark | 50 |
| Seminar | A1 A2 A3 A17 B8 B9 B10 B11 B12 B13 B14 B15 B1 B2 B3 B4 B5 B6 B7 B16 B17 B18 B19 C1 C2 C3 C4 C5 C6 C7 C8 | The attendance to the seminars and the work being developed at the seminars will be considered for the final mark | 50 |

| Assessment comments |
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| Sources of information | |
|------------------------|---|
| Basic | <ul style="list-style-type: none"> - G. Carey, J. Oden (1984). Finite Elements. Prentice-Hall - A. Chadwick (1986). Hydraulics in Civil Engineering. Allen&Unwin - J. Donea (2003). Finite Element Methods for Flow Problems. Wiley - P. Gresho, R Sani (2000). Incompressible flow and the finite element method. Wiley - O. Pironneau (1989). Finite Element Methods for Fluids. Wiley - J. Puertas Agudo (2000). Apuntes de Hidráulica de Canales. Nino - Singiresu Rao (2005). The Finite Element Method in Engineering. Elsevier - O. C. Zienkiewicz, R.L. Taylor (1982). The Finite Element Method. Vol 3, Fluid dynamics. Mc Graw Hill |
| Complementary | |

| Recommendations |
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| Subjects that it is recommended to have taken before |
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| Subjects that are recommended to be taken simultaneously |
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| Subjects that continue the syllabus |
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| Other comments |
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(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.