



| Teaching Guide | | | | |
|--------------------------|--|--------|---|---------|
| Identifying Data | | | 2017/18 | |
| 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 | Optativa | 6 |
| Language | English | | | |
| Teaching method | Face-to-face | | | |
| Prerequisites | | | | |
| Department | Enxeñaría Civil Matemáticas | | | |
| 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 | http://caminos.udc.es/info/asignaturas/201/masterindex.html | | | |
| 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. | | | |

| Study programme competences / results | |
|---------------------------------------|---------------------------------------|
| Code | Study programme competences / results |
| | |

| Learning outcomes | | | |
|---|---------------------------------------|-----|----|
| Learning outcomes | Study programme competences / results | | |
| 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 free surface and porous medium. Knowledge of numerical models applied to hydraulic engineering. Capacity use and analyze the results of a hydraulic model. Ability to design, develop and analyze numerical schemes used in a hydraulic model. | A1 | B1 | C1 |
| | A1 | B1 | C1 |
| | A1 | B1 | C1 |
| | A1 | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | B1 | C1 |
| | | BJ1 | |
| | | BJ1 | |
| | BJ1 | | |
| | BJ1 | | |



| 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 / Results | Teaching hours (in-person & virtual) | 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 / Results | 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

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

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Other comments

(*)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.