



Universidad de Jaén
School of Engineering of Linares

Hydrogeology

2024-2025

Grado en Ingeniería de Tecnologías Mineras
Doble Grado en Ingeniería de tecnologías mineras e Ingeniería civil



GRUEA



Guías docentes UJA

Horarios de tutorías

Llamamientos PAU

Syllabus 2024-25 - 14112006 - Hydrogeology (Hidrogeología)

Caption

- Level 1: Tutorial support sessions, materials and exams in this language
- Level 2: Tutorial support sessions, materials, exams and seminars in this language
- Level 3: Tutorial support sessions, materials, exams, seminars and regular lectures in this language

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Full version (Spanish)

English

DEGREE: Grado en Ingeniería de minas (14112006)
 FACULTY: SCHOOL OF ENGINEERING OF LINARES
 DEGREE: Doble grado en Ingeniería de tecnologías mineras e Ingeniería civil (15012012)
 FACULTY: SCHOOL OF ENGINEERING OF LINARES
 ACADEMIC YEAR: 2024-25
 COURSE: Hydrogeology

SYLLABUS

1. COURSE BASIC INFORMATION

NAME: Hydrogeology
 CODE: 14112006 (*)
 LANGUAGE: English
 ECTS CREDITS: 6.0
 ACADEMIC YEAR: 2024-25
 LEVEL: 2
 YEAR: 3
 SEMESTER: PC

2. LECTURER BASIC INFORMATION

NAME: HIDALGO ESTÉVEZ, M^a CARMEN
 DEPARTMENT: U117 - GEOLOGÍA
 FIELD OF STUDY: 427 - GEODINÁMICA EXTERNA
 OFFICE NO.: D - D-104
 E-MAIL: chidalgo@ujaen.es
 P: 953648521
 WEBSITE: <https://www.ujaen.es/departamentos/geologia/>
 ORCID: <https://orcid.org/0000-0002-0982-786X>
 LANGUAGE: English
 LEVEL: 2

3. CONTENT DESCRIPTION

- **The Hydrologic Cycle.** Groundwater as a natural resource. The water cycle: concept, elements, hydrologic equation and hydrologic budget. The groundwater system in the hydrologic cycle.
- **Hydrologic properties of Earth materials.** Porosity and water content of soil. Effective porosity and specific retention. Porosity values for sediments and rocks. Permeability. Soil water. Water table recharge.
- **Properties of aquifers.** Aquifers, aquitards and aquicludes. Types of groundwater conditions. Confined, semi-confined and unconfined aquifers. Water table and piezometric head. Classification of springs.
- **Hydrometeorology and surface hydrology.** Precipitation, evaporation and evapotranspiration. Infiltration. Runoff and streamflow: hydrograph separation, rainfall-runoff relationships and measurement of streamflow.
- **Darcy's Law.** Darcy's experiment and Darcy's Law: hydraulic gradient and hydraulic conductivity. Specific discharge and average linear velocity. Transmissivity and specific yield.
- **Principles of ground-water flow.** Gradient of hydraulic head, flow lines and flow nets. Regional groundwater flow: Hubbert and Toth's theories.
- **Ground-water flow to wells and well hydraulics.** Pumping test: basic assumptions and Dupuit equation. Steady-state conditions. Unsteady radial flow. Methods in leaky aquifers. Recovery test. Slug tests.
- **Quality of groundwater.** Units of measurement. Types of chemical reactions in water. Major ion chemistry. Presentation of results of chemical analysis. Water quality standards. Spanish water regulations.
- **Groundwater contamination.** Sources of groundwater pollution. Pollution in relation to water use. Groundwater restoration.

4. COURSE DESCRIPTION AND TEACHING METHODOLOGY

Lectures (theory): 2 hours per week

Laboratory and practical problems: 2 hours per week

Hydrogeological field trip in the mining district of Linares: 1 day

Students with special educational needs should contact the Student Attention Service (Servicio de Atención y Ayudas al Estudiante) in order to receive the appropriate academic support

5. ASSESSMENT METHODOLOGY

Exam paper (70% of the total score) combined with evaluation of the laboratory exercises and field activities (25%), and participation in seminars and practices (5%).

6. BOOKLIST [\(Access the bibliography in the Library catalog\)](#)

MAIN BOOKLIST:

- Hydrogeology: principles and practice. Edition: -. Author: Hiscock, Kevin M.. Publisher: Malden [etc.]: Blackwell, 2007 [\(Library\)](#)
- Groundwater hydrology. Edition: 3rd ed. Author: Todd, David Keith. Publisher: [New York]: John Wiley, cop. 2005 [i.e. 2004] [\(Library\)](#)
- Applied hydrogeology. Edition: 4th. ed. Author: Fetter, C. W.. Publisher: Upper Saddle River: Prentice Hall, cop. 2001 [\(Library\)](#)
- Hydrology [Recurso electrónico]: principles, analysis and design. Edition: Rev. 2nd ed. Author: Raghunath, H. M. Publisher: New Delhi : New Age International (P) Ltd., Publishers, c2006 [\(Library\)](#)

ADDITIONAL BOOKLIST:

- Contaminant hydrogeology. Edition: 2nd ed. Author: Fetter, C. W.. Publisher: Upper Saddle River: Prentice Hall, cop. 1999 [\(Library\)](#)
- Groundwater Geochemistry [Recurso electrónico] : A Practical Guide to Modeling of Natural and Contam. Edition: 2nd Edition.. Author: Merkel, Broder J.. Publisher: Berlin, Heidelberg : 2005 Springer-Verlag Berlin Heidelberg, 2008. [\(Library\)](#)
- Uranium, Mining and Hydrogeology [Recurso electrónico] . Edition: -. Author: Merkel, Broder J.. Publisher: Berlin, Heidelberg : Springer-Verlag Berlin Heidelberg, 2008. [\(Library\)](#)
- Geochemistry, groundwater and pollution. Edition: 2nd ed. Author: Appelo, C. A. J.. Publisher: Boca raton[etc.] : CRC Press, cop. 2005 [\(Library\)](#)
- Groundwater recharge from run-off, infiltration and percolation [Recurso electrónico] . Edition: -. Author: SEILER, K.-P.. Publisher: Dordrecht : Springer, 2007. [\(Library\)](#)
- Field hydrogeology. Edition: 3rd ed.. Author: Brassington, Rick. Publisher: Chichester, England ; Hoboken, NJ : John Wiley, c2007. [\(Library\)](#)
- Practical problems in groundwater hydrology. Edition: -. Author: Bair, E. Scott. Publisher: Upper Saddle River: Pearson Education, cop. 2006 [\(Library\)](#)
- Effects of urbanization on groundwater [Recurso electrónico] : an engineering case-based approach fo. Edition: -. Author: Environmental and Water Resources Institute (U.S.). Urbanization Effects on Groundwater Task Committee. Publisher: Reston, Va. : American Society of Civil Engineers, c2010 [\(Library\)](#)
- Hydrogeology laboratory manual. Edition: -. Author: Lee, Keenan. Publisher: Upper Saddle River, N.J.: Pearson Education, cop. 2003 [\(Library\)](#)
- Groundwater reactive transport models [Recurso electrónico]. Edition: -. Author: -. Publisher: Dubai, United Arab Emirates : Bentham Books, 2012 [\(Library\)](#)
- Groundwater hydrology of springs [Recurso electrónico] : engineering, theory, management, and sustai. Edition: -. Author: -. Publisher: Burlington, MA : Butterworth-Heinemann, c2010. [\(Library\)](#)

7. SUSTAINABLE DEVELOPMENT GOALS

Agua limpia y saneamiento

DETAILED INFORMATION

Access to water, sanitation and hygiene is a human right. Water is essential not only to health, but also to poverty reduction, food security, peace and human rights, ecosystems and education. Main goals related to this SDG:

6.1 Achieve access to safe and affordable drinking water.

6.3 Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials.

6.4 Substantially increase water-use efficiency and ensure sustainable withdrawals and supply of freshwater.

6.5 Implement integrated water resources management.

6.6 Protect and restore water-related ecosystems.

8. VIRTUAL / CLASSROOM TEACHING SCENARIO

Activities	Format	Teaching methods
28 sessions on the contents of the program	Face-to-face 100%	28 master class sessions, lasting one hour each.
16 sessions on problem-solving and exercises	Face-to-face 100%	They will consist of 16 sessions, one hour each.
3 sessions in the lab and field	Face-to-face 100%	3 practical sessions (1 in lab, 2 in the field), lasting 12 hours in total.
Tutorships	Face-to-face 100%	Tutoring sessions

Exam paper (70% of the total score) combined with evaluation of the laboratory exercises and field activities (25%), and participation in seminars and practices (5%).

9. VIRTUAL TEACHING SCENARIO

TEACHING METHODOLOGY AND TRAINING ACTIVITIES

Activities	Format	Teaching methods
28 sessions on the contents of the program	Online	28 master class sessions, lasting one hour each, conducted by videoconference.
16 sessions on problem-solving and exercises	Online	They will consist of 16 online sessions synchronously, one hour each.
3 sessions in the lab and field	Online	Substitution of practical sessions with online training activities. They will be developed synchronously, based mainly on computer calculations and simulations using specific virtualized software.
Tutorships	Online	All tutoring sessions will be conducted online (synchronous and asynchronous)

EVALUATION

Evaluation system	Format	Porcentaje
Attendance and participation in activities	synchronous online	5 %
Written exam	synchronous online	30%
Evaluation of cases/problems delivered	asynchronous online	40%
Delivery of reports of lab and field practices	asynchronous online	25%

Valuation of participation in theoretical classes, practices and seminars (5% of the total grade).

Written exam of theory and problems (30% of the total rating). This test will be carried out by videoconference, with defined time for its resolution.

Evaluation of practical work and problems: specific practical exercises will be proposed for each thematic chapter (40 % of the total grade).

Evaluation of lab and field reports (25% of the total grade).

RESOURCES

The synchronous online teaching and written examination will be carried out by videoconference, in accordance with the guidelines set out by the University of Jaén and in the schedule established by the EPSL. The delivery and management of exercises/cases/reports will be carried out using the UJA teaching platform. The software required for the development of the practices will be available for use through virtualized access.

DATA PROTECTION CLAUSE (on line exams)

Institution in charge of data processing: Universidad de Jaén, Campus Las Lagunillas, s/n, 23071 Jaén

Data Protection Delegate: dpo@ujaen.es

Purpose: In accordance with the Universities Law and other national and regional regulations in force, carrying out exams and assessment tests corresponding to the courses students are registered in. In order to avoid frauds while sitting the exam, the exam will be answered using a videoconference system, being able the academic staff of the University of Jaén to compare and contrast the image of the person who is answering the exam with the student's photographic files. Likewise, in order to provide the exam with evidential content for revisions or claims, in accordance with current regulation frameworks, the exam will be recorded and stored.

Legitimacy: compliance with legal obligations (Universities Law) and other national and regional regulations currently in force.

Addressees: service providers who are the owners of the platforms where the exams are carried out and with whom the University of Jaén has signed the corresponding data access contracts.

Storage periods: those established in current in force regulations. In the specific case of exam videoconference recordings, not before the examination records and transcripts are closed or the exam can still be reviewed or challenged.

Rights: you can exercise your right of access, amendment, cancellation, opposition, suppression, limitation and portability by sending a letter to the postal or electronic address indicated above. In the event that you consider that your rights have been violated, you may submit a complaint to the Andalusian Council for Transparency and Data Protection www.ctpdandalucia.es

CLASS RECORDING CLAUSE PERSONAL DATA PROTECTION

Person in charge: Universidad de Jaén, Paraje Las Lagunillas, s/n; Tel.953 212121; www.ujaen.es

Data protection delegate (DPO): TELEFÓNICA, S.A.U. ; Email: dpo@ujaen.es

Procedure aim: To manage proper recordings of teaching sessions with the aim of facilitating learning process under a multimodal and/or online teaching

Period for record storage: Images will be kept during legal term according to regulations in force

Legitimacy: Data will be managed according to legal regulations (Organic Law 6/2001, December 21, on Universities) and given consent provided by selecting corresponding box in legal admission documents

Data recipients (transfers or assignments): Any person allowed to get access to every teaching modality

Rights: You may exercise your rights of access, rectification, cancellation, portability, limitation of processing, deletion or, where appropriate, opposition. To exercise these rights, you must submit a written request to the Information, Registration and Electronic Administration Service of the University of Jaén at the address above, or by e-mail to the address above. You must specify which of these rights you are requesting to be satisfied and, at the same time, you must attach a photocopy of your ID card or equivalent identification document. In case you act through a representative, legal or voluntary, you must also provide a document that proves this representation and identification. Likewise, if you consider that your right to personal data protection has been violated, you may file a complaint with the Andalusian Data Protection and Transparency Council www.ctpdandalucia.es

