

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	296 - Degree in Geology
ECTS	6.5
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	---

1.General information**1.1.Introduction****1.2.Recommendations to take this course****1.3.Context and importance of this course in the degree****1.4.Activities and key dates****2.Learning goals****2.1.Learning goals****2.2.Importance of learning goals****3.Aims of the course and competences****3.1.Aims of the course****3.2.Competences****4.Assessment (1st and 2nd call)****4.1.Assessment tasks (description of tasks, marking system and assessment criteria)****5.Methodology, learning tasks, syllabus and resources****5.1.Methodological overview****5.2.Learning tasks****5.3.Syllabus**

Geometric crystallography

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1. The notion of crystal: historic development of Crystallography. Order and periodicity. The properties of crystalline matter.
2. Crystal lattices. Bidimensional periodic lattices. The Bravais lattices and the crystal systems. Elements of periodic lattices
3. Crystallographic notations: lattice points, lines and planes. Weiss parameters and Miller indices. Relationship between crystal morphology and structure. Empirical laws
4. Crystallographic zones.
5. Symmetry I. Symmetry operations in 2D and 3D
6. Symmetry II. Translational symmetry. The 32 point groups. Crystal systems and symmetry.
7. Crystal morphology. Forms of the 7 systems.
8. Representing Crystals: stereographic projection.

Structural crystallography and crystal chemistry

9. The symmetry of the unit cell. Space groups. Atomic positions and structural sites.
10. Crystal structures. Rules of the crystal structures. Pauling rules.
11. Chemical variability of crystals: solid solution, isomorphism and stoichiometry (this subject will be taught in English)
12. The X-ray diffraction of crystals. Diffraction methods: fundamentals and the information they provide.

Physical properties of crystals

13. Introduction to the physical properties of crystals, and its relationship with the crystal symmetry
14. Optical properties I. Nature of light and other basics
15. Optical properties II. Optical isotropy and anisotropy. The optical surfaces.

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16. Optical properties III. The transmitted-light polarizing microscope.

17. Optical properties IV. Optical analysis of crystals with parallel light, without analyzer. Optical analysis with parallel light and analyzer. Optical analysis with convergent light.

18. The color of mineral.

19. The electrical, magnetic and thermal properties of crystals.

Crystal Dynamics

20. The real crystal. Defects in crystals and crystal dynamics. The influence of defects on the physical properties of the crystals.

21. Crystal defects: point, line, two and three dimensional defects in crystals.

22. Crystal formation and growth. The morphology of the real crystal. Aggregates and twins.

23. Polymorphism.

Practical sessions

Geometrical crystallography: Sessions 1 to 7

X-ray Diffraction: Session 9

Optical microscopy: Sessions 10-16

Review of Geometric Crystallography: Practice

5.4.Course planning and calendar

5.5.Bibliography and recommended resources

BB

Amorós, José Luis. El cristal : morfología, estructura y propiedades físicas / José Luis Amorós . - 4a ed. ampl. Madrid : Atlas, D.L. 1990

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- BB** Bloss, F. Donald. Crystallography and Crystal Chemistry : an introduction / F. Donald Bloss . - 2nd printing Washington : Mineralogical Society of America, 2000
- BB** Bloss, F. Donald. Introducción a los métodos de cristalografía óptica / F. Donald Bloss ; traducido por Paloma Gastesi ; revisado por José M. Fúster Casas . - 5a. ed. Barcelona : Omega, cop.1994
- BB** Cristalografía / José Ma. Amigó... [et al.] Madrid : Rueda, D.L. 1981
- BB** Frye, Keith. modern mineralogy / Keith Frye New Jersey : Prentice-Hall, cop. 1974
- BB** Galí Medina, Salvador. Cristalografía : teoría reticular, grupos puntuales y grupos espaciales / Salvador Galí Medina . - [1a.ed.] Barcelona : PPU, 1992
- BB** Gay, Peter. Introducción al estado cristalino / Peter Gay ; versión española por E. de la Fuente Cullell ; adaptación C. de la Fuente Cullell . - 1ª ed. Barcelona : Eunibar, 1977
- BB** Hammond, Christopher. The basics of crystallography and diffraction / Christopher Hammond Oxford [etc.] : International Union of Crystallography : Oxford University Press, 1998
- BB** Hibbard, Malcolm J.. Mineralogy : a geologist's point of view / M.J. Hibbard.. - 1st ed. Boston : McGraw-Hill, c2002.
- BB** Kelly, A.. Crystallography and crystal defects / A. Kelly, G.W. Groves, and P. Kidd . - Rev. ed Chichester, England : Wiley, 2000
- BB** Klein, Cornelis. Manual de mineralogía : basado en la obra de J.D. Dana / Cornelis Klein, Cornelius S. Hurlbut, Jr. ; [versión española por J. Aguilar Peris] . - 4a. ed. Barcelona [etc.] : Reverté, D.L. 1996-1997

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- BB** Modern crystallography / [edited by] Boris K. Vainshtein. Vol. 1, Fundamentals of crystals : symmetry and methods of structural crystallography / Boris K. Vainshtein . - 2nd enlarged ed Berlin [etc.] : Springer-Verlag, cop. 1994
- BB** Nesse, William D.. Introduction to mineralogy / William D. Nesse New York ; Oxford : Oxford University Press, cop. 2000
- BB** Nesse, William D.. Introduction to optical mineralogy / William D. Nesse . - 2nd ed New York : Oxford University Press, 1991
- BB** Phillips, F.C.. Introducción a la cristalografía / F.C. Phillips ; [traducido por Juan L. Martín Vivaldi] . - 4a. ed Madrid : Paraninfo, 1988
- BB** Putnis, Andrew. Introduction to mineral sciences / Andrew Putnis . - [1st. publ.] [Cambridge] : Cambridge University Press, 1992
- BB** Rodríguez Gallego, M.. La difracción de los rayos X / M. Rodríguez Gallego . - 1a. ed. Madrid : Alhambra, 1982
- BB** Rosenberg, H.M.. El estado sólido : una introducción a la física de los cristales / H.M. Rosenberg ; traducción de Ana Gómez Antón . - [1a ed.] Madrid : Alianza, D.L.1991
- BB** Ruiz Cruz, María Dolores. Introducción a la cristalografía para químicos / María Dolores Ruíz Cruz Málaga : Librería Agora, D.L. 1990
- BB** Santoyo Ramírez, Alicia. Fundamentos de cristalografía geométrica / Alicia Santoyo Ramírez . - 1a. ed. Valencia : López Mezquida, 1981
- BB** Wenk, Hans-Rudolf.. Minerals : their constitution and origin / Hans-Rudolf Wenk and Andrei Bulakh. Cambridge :

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Cambridge University Press , 2004.

LISTADO DE URLs:

Compilación de diversos materiales
didácticos para Cristalografía y
Mineralogía -

[http://www.ucm.es/info/crismine/TEXTOS_MONOGRAFICOS.htm]

Curso de Cristalografía con notas de
óptica en PPT -

[<http://www.geo.umass.edu/courses/geo311/lectures.html>

]

Curso de Cristalografía en español - [

<http://www.uned.es/cristamine/inicio.htm>]

Curso de Mineralogía -

[<http://www.tulane.edu/~sanelson/eens211/#Lecture%20Notes>]

Curso de óptica -

[<http://ffden-2.phys.uaf.edu/213.web.stuff/Rachel%20Ingersoll/WEBPAGE1/index>.

]

Curso de óptica en PPT -

[http://www.umanitoba.ca/faculties/science/geological_sciences/faculty/sherriff/we

]

Formas cristalinas y minerales que las
presentan -

[<http://www.rockhounds.com/rockshop/xtal/index.html#index>

]

IUCr - CWW Teaching and Education in
Crystallography -

[<http://www.iucr.org/cww-top/edu.index.html>]

Notas de óptica -

[http://www.science.smith.edu/departments/Geology/Min_jb/Optics/

]

Óptica microscópica -

[<http://www.brocku.ca/earthsciences/people/gfinn/optical/222lect.htm>]

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Página sobre Mineralogía que incluye enlaces a temas de Cristalografía -
[<http://webmineral.com/>]

Recopilación de recursos en internet sobre Mineralogía -
[<http://homepages.udayton.edu/~koziolam/resminpet.html>]
]

Recopilación de recursos en internet sobre Mineralogía - [
<http://www.minerant.org/software.html>]

Sobre difracción de rayos X -
[<http://www.eserc.stonybrook.edu/ProjectJava/Bragg/index.html>]
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