COURSE GUIDE FOR

Academic year 2020-2021

PHARMACEUTICAL HYDROLOGY

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Optional	Pharmaceutical Hydrology	4º, 5º	1º	6	Optional

TEACHING STAFF	Postal address, telephone nº, e-mail address
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DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT	
Degree in Pharmacy	

PREREQUISITES and/or RECOMMENDATIONS (if necessary)
Have adequate knowledge of: General Chemistry; Inorganic Chemistry; Physics; Physical Chemistry; Geology Applied to Pharmacy; Pharmacology; Pharmaceutical Legislation; Pharmaceutical Technology.
BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE IN PHARMACY)
Concept of Pharmaceutical Hydrology. The hydrologic cycle: environmental and health implications. Concept, origin and properties of mineral-medicinal waters. Hydrothermal treatments (hydropinic cure and balneotherapy), Thalassotherapy and Pelotherapy. Spanish and European Spas.
GENERAL AND PARTICULAR ABILITIES
Learn about the concept of mineral-medicinal water. Understand that water can be an agent with therapeutic purpose. Know the different origins in the nature of the mineral-medicinal waters and properties that are derived. Learn about the different mechanisms of action of mineral waters and its relationship with its properties

(chemical, physical and physic-chemical, among others).

Acquire knowledge on the different modalities of health application of mineral-medicinal waters: hydrothermal cures (hydropinic cure and balneotherapy), Thalassotherapy and pelotherapy.

Know the location and characteristics of mineral water, peloids and treatments of the main spas of Spain and Europe.

Know the types of water that exist in nature through the hydrological cycle and its key elements. Relationship between the characteristics of natural waters and their origin.

Evaluate the quality of the waters, and classify them by means of physical, chemical and physic-chemical analysis.

Understand water as a natural resource valuable and scarce, with important health implications.

OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

Understand the concept of Pharmaceutical Hydrology and concept, origin and properties of mineral-medicinal waters.

Understand the different ways, mechanisms of action and application techniques: hydrothermal cures (hydropinic cure and balneotherapy), Thalassotherapy and Pelotherapy; as well as the mechanisms of protection of these waters and the various quality controls that are applied to them.

Spas.

The hydrological cycle.

Water in nature: origin, properties and importance for the human being.

DETAILED SUBJECT SYLLABUS

THEORETICAL ISSUES:

FIRST PART. BASIC PRINCIPLES

Lesson 1 - Concept. 1.1. Concept of Hydrology. 1.2. Pharmaceutical Hydrology. 1.3. Medical Hydrology. 1.4. Historical development. 1.5 Water as a constituent of the Earth and of broad uses for mankind. 1.6. Study skills. 1.7. Bibliographic sources in Hydrology and Pharmaceutical Hydrology.

Lesson 2 – The water cycle. 2.1 Approach and concept. 2.2. Main Hydrological Elements. 2.3 Precipitation. 2.4 Origin and types of precipitation. 2.5 Measurement of precipitation. 2.6. Importance of precipitation on the Environment and the Health Sciences.

Lesson 3 - Soil and cycle of water. 3.1 Concept of Soil. 3.2. The Soil like fractionator of waters of the Hydrological Cycle. 3.3 Runoff-erosion. 3.4 Evaporation-transpiration. 3.5 Importance of Soil use in Environmental and Health Sciences.

Lesson 4 - Aquifers. 4.1 Infiltration of water into the subsoil. 4.2. Groundwater. 4.3 Aquifers. 4.4 Hydrological parameters of rocks (physical). 4.5 Piezometric surface. 4.6 Types of aquifers. 4.7 Downloading and recharging 4.8. Pollution of aquifers. Importance in Health Sciences.

Lesson 5 - Properties of the Natural Waters. 5.1. Introduction. 5.2. Synopsis of the main properties of Natural Waters. 5.3 Physical properties. 5.4 Chemical properties: Marine Waters and other Natural Waters. 5.5 Processes that control the properties of the waters. 5.6. The Natural Waters and biogeochemical cycles.

Lesson 6 – Natural Waters, Environment and Health. 6.1 Approach 6.2. Outline of selected examples. 6.3. Effect of the hardness of the water. 6.4 Effect of the fluoride content. 6.5. Effect of the content of selenium. 6.6 Effect of the content of iodide. 6.7. Other cases.

SECOND PART: MINERAL-MEDICINAL WATERS AND OTHER APPLICATIONS

Lesson 7 - Concept and origin of Mineral-Medicinal Waters. 7.1. Definition of Mineral-Medicinal Waters. Thermalism. 7.2. Disputes about the origin of the Mineral-Medicinal Waters. 7.3 Meteoric origin. 7.4. Endogenous origin. 7.5. Mixed origin. 7.6 Hydrominerals basins. 7.7. Mineralization of the water. 7.8 Examples of origin of deposits of Mineral-Medicinal Waters: Lanjarón, Alhama, Vichy (France) 7.9. Main springs and spas of Mineral-Medicinal Waters in Spain and Europe.

Lesson 8 - Properties of the Mineral-Medicinal Waters. 8.1 Classification of their properties: physical, chemical, physic-chemical and therapeutic. 8.2 Main physical properties. 8.3 Main chemical properties. 8.4 Main physicochemical properties.

Lesson 9 - Classification of the Mineral-Medicinal Waters. 9.1. Approach. 9.2. Classifications based on physical properties. 9.3. Classifications based on chemical properties. 9.4. Types of graphical representations.

Lesson 10 - Protection and quality control of the Mineral-Medicinal Waters. 10.1. Protection of Mineral-Medicinal Waters. 10.2. Sources of pollution. 10.3. Parameters of protection. Validity. 10.4. Intrinsic and extrinsic contamination. 10.5 Quality control plan for the Mineral-Medicinal Waters.

Lesson 11 - Therapeutic properties of the Mineral-Medicinal Waters. 11.1. Hydrothermal cures. Definition and approach. 11.2. Specific and non-specific actions. 11.3 Routes and management techniques. 11.4 Applications orally (Hydropinic Cures). 11.5 Description of actions taken by mouth: gastric, intestinal, liver (biliary) kidney, urinary and other actions.

Lesson 12 - Topically therapeutic action of Mineral-Medicinal Waters (balneotherapy). 12.1. Approach. 12.2. Mechanisms of action. 12.3. Scheme of the main applications. 12.4 Rheumatology. 12.5 Dermatology.

Lesson 13 - Thalassotherapy. 13.1. Approach. 13.2. Actions on the human organism of the baths with sea water. 13.3. Therapeutic indications. 13.4. Techniques of Thalassotherapy. 13.5. Examples: Dead Sea, Mar Menor, etc.

Lesson 14 - Pelotherapy. 14.1. Approach. Definition. 14.2. Stages of the peloids. 14.3. Types of peloids. 14.4. Preparation. 14.5 Maturation. 14.6 Properties. Quality control. 14.7 The peloids actions.

PRACTICE ISSUES

Practice 1. Classification of Mineral-Medicinal Waters by their chemical composition. Major ions.

Practice 2. Preparation of peloids. Determination of main properties. Quality control.

FIELD PRACTICE

Guided visit to resorts, properties of its waters, description and demonstration of the various types of therapeutic treatments used.

SEMINARS AND PROJECTS PRESENTATION

Seminar 1. Bibliographic search: books, journals, reports; computer search. Processing of the information. Writing a bibliographic work.

Seminar 2. Oral presentation of project. Interpretation of field practice. Scientific criticism and debate.

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RECOMMENDED INTERNET LINKS

- Sociedad Española de Hidrología Médica: http://www.hidromed.com/
-La Société française d'hydrologie et de climatologie médicales: http://www.soc-hydrologie.org/gb_index.php
- Sociedade Portuguesa de Hidrologia Médica e Climatologia: http://www.sphidrologia.pt/

TEACHING METHODOLOGY

- Theoretical lectures. This teaching method is based on the face-to-face lecture class. Approximately one hour. The professor will explain the theoretical foundations of the subject. The student participation will be stimulated.

- Practical lectures. They will take place in the laboratory. The number of students will be adapted to the laboratory, the student at the subject and what the practical lectures allow. The professor will guide the individual work of each one. The daily work of each student will be valued although at the end there will be a test, oral and written, to estimate the degree of achievement of these practical sessions.
- Seminars, exposition, and debate. In these sessions, the questions related to the theoretical sessions will be solved, clarified and discussed. Moreover, the students could use these sessions to do activities exposition (always guided by the professor); these sessions will be accompanied by debate.

ASSESSMENT (ASSESSMENT INSTRUMENTS, CRITERIA AND PERCENTAGE VALUEOF FINAL OVERALL MARK, ETC.)

- Written theoretical exams on the contents of the program. They may be test type and / or application questions of theoretical concepts or problems: **60% of the final grade.**
- Seminars and practices tests: oral and written. It will try to be an exam where theoretical-practical knowledge is applied through problem solving. **Attendance at the excursion is mandatory**; **it will take place on a Saturday**. Passing both the seminars and practices is an essential condition for passing the subject: **20% of the final grade.**
- Collective project on specific aspects of the subject. It will be presented: **10% of the final grade.**
- Attendance to theoretical lectures, practices and seminars: **10% of the final grade.**

Passing the exam is necessary to get a higher grade than the average between the null value and the maximum grade. The grades lower, but very close to the average, will be valued taking into account the student trajectory (in this subject).
The practical theoretical sessions and seminars are mandatory.
The exposition of the collective project will be evaluated according to: Level of knowledge, clarity in the exposition, defense of the exposed knowledge, etc.

DESCRIPTION OF THE EXERCISES WHICH WILL CONSTITUTE SINGLE FINAL ASSESSMENT AS ESTABLISHED IN UGR REGULATIONS

- According to the Regulations for the Evaluation and Qualification of Students of the University of Granada (Approved by the Governing Council in its extraordinary session of May 20, 2013), the completion of a single final evaluation is contemplated, which may be accepted by those Students who are unable to comply with the continuous assessment method due to work reasons, health status, disability or any other duly justified reason that prevents them from following the continuous assessment regime. To qualify for the final single assessment, the student, in the first two weeks after enrolling in the course, will request it from the Director of the Department, who will transfer it to the corresponding teaching staff, citing and accrediting the reasons for not being able to follow the continuous evaluation system. If ten days have elapsed without the student having received an express written response from the Director of the Department, it shall be understood that this has been rejected. In case of denial, the student may file, within a month, an appeal before the Rector, who may delegate to the Dean or Director of the Center, exhausting the administrative route.
- Students who have opted for this system and have been admitted to it during the first two weeks of teaching, will have to take and pass an theoretical exam (test-type questions or development of a topic) (70% of the grade) and a practical test (laboratory, problems, questions, etc.) (30% of the grade).

SCENARIO A (ON-CAMPUS AND REMOTE TEACHING AND LEARNING COMBINED)

TUTORIALS

TIMETABLE (According to Official Academic Organization Plan)	TOOLS FOR TUTORIAL ATTENTION (Indicate which digital tools will be used for tutorials)
Click below to look up information: https://www.ugr.es/~edafolo/pdf/tutorias/ **Fernández González, María Virginia** • Monday and Wednesday: from 10:30 am to 12:30 pm • Thursday: from 12:00 pm to 2:00 pm • Friday: from 2:00 to 3:00 pm **Párraga Martínez, Jesús Francisco** • Monday, Wednesday and Friday: from 10:30 am to 12:30 pm **Molinero García, Alberto** • Lunes: from 9:00 to 11,00 am	• Tutorials will be carry out by official email or Video call (Google Meet). • Tutorials will be asked by the student. The professor may propose group tutorials, mandatory or optional, if he deems it appropriate. • Forums and messages in Prado.

MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY

- Online lectures and face-to-face lectures will depend on health circumstances. Online lectures will focus on theoretical lessons, while face-to-face lectures will focus on laboratory lessons.
- The list of topics will be the same. It would be complemented with: 1) synchronous classes by Google Meet; 2) asynchronous recorded classes; 3) video projections; and 4) other teaching documents shared by Google drive.
- The practical lectures will be carried out face-to-face, but they are complemented by recorded theoretical videos.
- Just in case the visit to a Spa is not possible, a video about the Spa will be sent to the students. They will have to issue a report.

MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)

Ordinary assessment session

- Written theoretical exams on the contents of the program. They could be test type and/or application questions of theoretical concepts, or problems: **60% of the final grade**.
- Seminars and practices tests: oral and written. It will try to be an exam where theoretical-practical knowledge is applied through problem solving. Passing both the seminars and practices is an essential condition for passing the subject: **20% of the final grade.**
- Collective project on specific aspects of the subject. It will be presented: **10% of the final grade.**
- Attendance to theoretical lectures, practices and seminars: **10% of the final grade.**

The tests will be carried out, if the situation allows, face-to-face. If this were not possible, the tests would be presented by Prado Exam platform (solving both questions and problems) or Google Meet, always following the instructions issued by the UGR.

Extraordinary assessment session

• Final exam with theoretical questions (70%) and practical questions (30%) related with the taught subject. The test would be face-to-face. If it was not possible, it will be done through the PRADO-EXAMEN Sometimes could be used Google-Meet for evaluation through oral tests.

Single final assessment

- A written test with questions and/or problems of the theoretical subject taught: 70% of the final grade.
- A written test with questions and/or exercises on the practical subject taught: 30% of the final grade.
- Both tests will be carried out in person, if the sanitary conditions or the provisions of the Center allow it, or virtually using the PRADO-EXAMEN platform, or the method that UGR enables for it, always following the instructions that dictate the UGR in this regard.
- In some cases, Google-Meet will be used for evaluation through oral tests.

SCENARIO B (ONCAMPUS ACTIVITY SUSPENDED)

TUTORIALS

TIMETABLE (According to Official Academic Organization Plan)	TOOLS FOR TUTORIAL ATTENTION (Indicate which digital tools will be used for tutorials)
Click below to look up information: https://www.ugr.es/~edafolo/pdf/tutorias/	• Tutorials will be carry out by official email or Video call (Google Meet). • Tutorials will be asked by the student. The professor may propose group tutorials, mandatory or optional, if he deems it appropriate. • Forums and messages in Prado.

MEASURES TAKEN TO ADAPT TEACHING METHODOLOGY

- All lectures would be virtual.
- They will be taught using the ways mentioned above. Lectures will be supplemented with follow-up actions (tutorials, task, activities,…)
- The practical sessions are also carried out virtually. They will be based on tutorials made on Powerpoint and on graphical material made by the professors in the specific laboratory where the classroom practices will be taught. The exposition of these tutorials will be carried out synchronously, with those included in the previous paragraph. There will also be a session on videoconference platforms for the discussion of the results in the different analytical determinations.
- Students (individually) will be given a topic. It will be developed by written report and a virtually exposition (Power Point or similar) will be done.
- The teacher-student contact channels described (Prado, Google-Meet, institutional mail, ..) are those currently authorized by the UGR.
- As an additional measure, special attention would be paid to providing teaching material to students through the different routes described.

MEASURES TAKEN TO ADAPT ASSESSMENT (Instruments, criteria and percentage of final overall mark)

Ordinary assessment session

- Written theoretical exams on the contents of the program. They could be test type and/or application questions of theoretical concepts, or problems: **60% of the final grade**.
- Seminars and practices tests: oral and written. It will try to be an exam where theoretical-practical knowledge is applied through problem solving. Passing both the seminars and practices is an essential condition for passing the subject: **20% of the final grade.**
- Collective project on specific aspects of the subject. It will be presented: **20% of the final grade.**

Tests and evaluable tasks would be carried out through Prado Exam platform and Google Meet, always following the instructions issued by the UGR at the time.

Extraordinary assessment session

- The distribution of tests and evaluable tasks would be the same as in condition A, but the continuous evaluation tests would be carried out through the Prado Exam platform and Google Meet.

Single final assessment

- A written test with questions and / or problems of the theoretical subject taught: 70% of the final grade.
- A written test with questions and / or exercises on the practical subject taught: 30% of the final grade.
- Both tests will be carried out in person, if the sanitary conditions or the provisions of the Center allow it, or virtually using the PRADO-EXAMEN platform, or the method that the UGR enables for it, always following the instructions that dictate the UGR.
- In some cases, Google-Meet will be used for evaluation through oral tests.

ADDITIONAL INFORMATION

Following the CRUE recommendations and the UGR Inclusion and Diversity Secretariat, the skills acquisition and assessment systems included in this teaching guide will be applied according to the design principle for all people, facilitating the learning and demonstration of knowledge according to the needs and functional diversity of the students.