# Universida<sub>de</sub>Vigo

#### Subject Guide 2023 / 2024

| IDENTIFYIN           | IG DATA   |                       |                    |   |
|----------------------|---|-----------------------|--------------------|---|
| Subject              |   |                       |                    |   |
| Subject              | analysis  |                       |                    |   |
| Code                 | 0016041V01403   |                       |                    |   |
| Study                | Grado en Ciencia v  |                       |                    |   |
| programme            | Tecnología de los   |                       |                    |   |
|                      | Alimentos   |                       |                    |   |
| Descriptors          | ECTS Credits  | Choose                | Year               | Quadmester                                    |
|                      | 6   | Mandatory             | 2nd                | 2nd   |
| Teaching             | Spanish   |                       |                    |   |
| language             | French  |                       |                    |   |
|                      | Galician  |                       |                    |   |
|                      | English   |                       |                    |   |
| Department           |   |                       |                    |   |
| <u>Coordinator</u>   | Falqué López, Elena   |                       |                    |   |
| Lecturers            | Falqué López, Elena   |                       |                    |   |
| E-mail               | efalque@uvigo.es  |                       |                    |   |
| Web                  |   |                       |                    |   |
| General              | In this *asignatura, the student will know the founda                                     | ations of those inst  | rumental techni    | cians of greater use and                      |
| description          | applicability in the analysis of foods.   |                       |                    |   |
|                      |   |                       |                    |   |
| Training ar          | d Learning Results  |                       |                    |   |
| Code                 |   |                       |                    |   |
| A3 Studen            | ts will be able to gather and interpret relevant data (n                                  | ormally within the    | ir field of study) | that will allow them to                       |
| have a               | reflection-based considered opinion on important issu                                     | ies of social, scient | ific and ethical   | nature.                                       |
| A4 Studen            | ts will be able to present information, ideas, problems                                   | and solutions bot     | n to specialist ai | nd non-specialist                             |
| audien               | ces.  |                       |                    |   |
| B1 Studen<br>researc | ts will acquire analysis, synthesis and information-ma<br>h activities in the food field. | nagement skills to    | contribute to pl   | anning and conducting                         |
| B2 Studen            | ts will acquire and put teamwork skills and abilities in                                  | to practice, whethe   | er these have m    | ultidisciplinary character                    |
| or not,              | In both national and international contexts, becoming                                     | familiar with a div   | ersity of perspe   | ctives, schools of                            |
| though               | t and practical procedures.   | food and the to -to-  |                    |   |
|                      | w the physical, chemical and biological foundations of                                    | Tood and its techn    | ological process   | <u>, , , , , , , , , , , , , , , , , , , </u> |

C4 To be familiar with the physical and chemical properties of food, as well as the analytical processes that are associated with their establishment.

C13 Ability to analyze food.

C17 Ability to analyze and assess food risks.

C20 Ability to implement quality systems in the food industry.

D1 Analysis, organization and planning skills.

Ability to communicate, both orally and in writing, in local and foreign languages. D3

- D4 Independent-learning and information-management skills.
- D5 Problem-resolution and decision-making skills.

D9 Interdisciplinary teamwork skills.

| Expected results from this subject  |    |                       |         |    |  |
|---|----|-----------------------|---------|----|--|
| Expected results from this subject  |    | Training and Learning |         |    |  |
|   |    |                       | Results |    |  |
| LO-1: Comprise the foundation of the distinct instrumental spectroscopic, electrochemical and   | A3 | B1                    | C1      | D1 |  |
| chromatographic techniques employees for the analysis and control of quality of the foods, food | A4 | B2                    | C4      | D3 |  |
| and environmental products.   |    |                       | C13     | D4 |  |
|   |    |                       | C17     | D5 |  |
|   |    |                       | C20     | D9 |  |

| LO-2: Know and identify the characteristics that owe to gather the analites to select the most adapted technique for his analysis. | A3<br>A4 | B1<br>B2 | C1<br>C4<br>C13<br>C17<br>C20 | D1<br>D3<br>D4<br>D5<br>D9 |
|--|----------|----------|-------------------------------|----------------------------|
| LO-3: Be able to select and apply the analytical techniques more adapted for the analysis of the                                   | A3       | B1       | C1                            | D1                         |
| foods (raw matters, foods elaborated and environmental products) to determine his characteristics                                  | 5 A4     | B2       | C4                            | D3                         |
| and like this can evaluate and control the food and environmental quality.   |          |          | C13                           | D4                         |
|  |          |          | C17                           | D5                         |
|  |          |          | C20                           | D9                         |
| LO-4: Treat, evaluate and interpret the results obtained in the determinations and train to the                                    | A3       | B1       | C1                            | D1                         |
| student so that it take consciousness of the social responsibility of his reports and his repercussion                             | n A4     | B2       | C4                            | D3                         |
| in the taking of decisions.  |          |          | C13                           | D4                         |
| -  |          |          | C20                           | D5                         |
|  |          |          |                               | P9                         |

Contents Topic

DIDACTIC UNIT I. Introduction to the Instrumental SUBJECT 1. Introduction to the instrumental methods of analysis. Analysis and to the Analytical Process. DIDACTIC UNIT II: Optical Methods. SUBJECT 2. Optical methods: Generalities.

| ,   | SUBJECT 3. Spectroscopy of molecular absorption UV-vis.           |
|---|---|
|   | SUBJECT 4. Spectroscopy of molecular luminescence.                |
|   | SUBJECT 5. Atomic spectroscopy.                                   |
| DIDACTIC UNIT III: Electrochemical Methods.     | SUBJECT 6. Electrochemical methods: Generalities.                 |
|   | SUBJECT 7. Electrodes.  |
|   | SUBJECT 8. Potentiometry.   |
| DIDACTIC UNIT IV: Chromatographic Methods.      | SUBJECT 9. Chromatography: Generalities.                          |
|   | SUBJECT 10. Paper and thin layer chromatography.                  |
|   | SUBJECT 11. High resolution liquid chromatography.                |
|   | SUBJECT 12. Gas chromatography.                                   |
| DIDACTIC UNIT V: Other instrumental techniques. | SUBJECT 13. Other instrumental techniques. Hyphenated techniques. |

Planning

|  | Class hours   | Hours outside the<br>classroom | Total hours |
|--|---------------|--------------------------------|-------------|
| Lecturing                                  | 28            | 42                             | 70          |
| Seminars                                   | 14            | 21                             | 35          |
| Laboratory practical                       | 14            | 0                              | 14          |
| Mentored work                              | 0             | 14                             | 14          |
| Problem and/or exercise solving            | 0             | 1                              | 1           |
| Report of practices, practicum and externa | l practices 0 | 14                             | 14          |
| Essay questions exam                       | 0             | 2                              | 2           |
|  |               |                                |             |

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

| Methodologies        |  |
|----------------------|--|
|                      | Description  |
| Lecturing            | Exhibition by part of the professor, or of the student in his case, of the most important appearances of the contents of the subjects of the course, theoretical bases and/or guidelines of a work, exercise or project to develop by the student. |
| Seminars             | Activities focused to the work on a specific subject, to proposal of the professor or of the student, that allow to deepen or complement the contents of the matter.   |
| Laboratory practical | Activities, in groups of 2 or 3 people, in which it will ascertain the direct application of the theoretical knowledges developed in the master sessions and seminars.   |
| Mentored work        | The student, of individual way or in group, elaborates a document on an appearance or concrete subject of the course, by what will suppose the research and collected of information, reading and handle of bibliography, editorial, exhibition    |
|                      |  |

| Personalized assistan | nce         |
|-----------------------|-------------|
| Methodologies         | Description |

| Laboratory practical  | To the start of each session of laboratory, the professor will do an exhibition of the contents to develop by the students. Likewise, during the development of the practices of laboratory, the student has to elaborate a fascicle of laboratory where collect all the relative observations to the experiment realised, as well as the data and results obtained. The student will have by anticipated, in the platform tem@, of the material employed in classes (so much theoretical, bulletins of problems, like scripts of the practices of laboratory). |
|---|---|
| Mentored work<br>In the sessions of resolution of problems and exercises, the professor will indicate the guid<br>routines for the resolution of the same. In the tutored works, will value the final document<br>his case also the exhibition of the same, on the thematic, conference, summary of reading<br>investigation or memory developed. The student will have by anticipated, in the Moovi pla<br>the material employed in classes (so much theoretical, bulletins of problems, like scripts o<br>practices of laboratory). |   |
| Tests   | Description   |
| Report of practices,<br>practicum and<br>external practices   | The student will have to elaborate a report of the practices realised in the laboratory where collect<br>all the relative observations to the experiments realised, the data obtained and the calculation of<br>the results, as well as the discussion of the same. The student will have by anticipated, in the<br>Moovi platform, of the material employed in classes (so much theoretical, bulletins of problems,<br>like scripts of the practices of laboratory).   |

| Assessment                         |   |               |          |          |                               |                            |
|------------------------------------|---|---------------|----------|----------|-------------------------------|----------------------------|
|                                    | Description   | Qualification | ٦        | Frair    | ning a                        | nd                         |
|                                    |   |               | Lea      | arniı    | າg Re                         | sults                      |
| Seminars                           | The assistance and participation in seminars will suppose until 10% of the final note, that will include the assistance, attitude, participation and results obtained in the seminars.<br>With this methodology evaluate all the results of learning.   | 10            | A3<br>A4 | B1<br>B2 | C1<br>C4<br>C13<br>C17<br>C20 | D1<br>D3<br>D4<br>D5<br>D9 |
| Laboratory<br>practical            | The practices of laboratory will value between -1.5 and +1.5 point and will<br>suppose until 15% of the final note, that includes the forcing of attend to all<br>the sessions, the realisation of all the practices and the preparation and<br>delivery of the memory of practices.<br>Also will take into account the attitude and participation of the student in<br>laboratory.<br>This part will have to be surpassed independently of the other to be able to<br>surpass the course and be in conditions to add the assessment of the other<br>activities.<br>With this methodology evaluate all the results of learning. | 15            | A3<br>A4 | B1<br>B2 | C1<br>C4<br>C13<br>C17<br>C20 | D1<br>D3<br>D4<br>D5<br>D9 |
| Mentored work                      | The participation, attitude, as well as the work in himself (form to tackle the concepts to work, editorial, presentationOf the document written and exhibition, to be the case) will suppose until 5% of the final note. With this methodology evaluate all the results of learning.   | 5             | A3<br>A4 | B1<br>B2 | C1<br>C4<br>C13<br>C17<br>C20 | D1<br>D3<br>D4<br>D5<br>D9 |
| Problem and/or<br>exercise solving | There will be a Partial (problems related to topics 1 to 5, inclusive) and/or a 2nd Partial or Final Exam. It is necessary to obtain, at least, a 5 (out of 10). With this methodology all the learning results are evaluated.  | 35            | A3<br>A4 | B1<br>B2 | C1<br>C4<br>C13<br>C17<br>C20 | D1<br>D3<br>D4<br>D5<br>D9 |
| Essay questions<br>exam            | There will be a Partial (topics 1 to 5, inclusive) and a 2nd Partial or Final<br>Exam. It is necessary to obtain, at least, a 5 (out of 10). In the 2nd Partial<br>and/or in the Final, a minimum score must be obtained in each of the Didactio<br>Units.<br>With this methodology all the learning results are evaluated.   | 35<br>c       | A3<br>A4 | B1<br>B2 | C1<br>C4<br>C13<br>C17<br>C20 | D1<br>D3<br>D4<br>D5<br>D9 |

# Other comments on the Evaluation

# **ANNOUNCEMENTS 1st and 2nd Opportunity**

There are two evaluation modalities (Continuous and Global), being theContinuous Evaluation the preferred one. Students who wish the GlobalEvaluation (100% of the grade in the official exam) must communicate it to theteacher, by e-mail, within a period not exceeding one month from the beginning the teaching of the subject.

## • Continuous Evaluation Mode.

It implies the attendance and accomplishment of all the described methodologies: theory exam (35%), problems exam (35%), laboratory practices (15%), tutored work (5%) and seminars (10%).

There will be 2 exams: First Partial (theory and problems) witheliminating character of subject and on a date to be agreed among all, and the2nd Partial on the official date of the exam. Those who do not pass the firstmidterm will have to go to the official date and examine both midterms. Boththe Midterm and Final exams will have a maximum duration of four hours with abreak between theory and problems. In each part of the exams - theory andproblems - a minimum of 5 points out of 10 must be obtained; in addition, in theory a minimum score must be obtained in each of the Didactic Units.

The practices will be graded by the teacher on the basis of the attendance (compulsory), and the attitude and aptitude of the students during the development of the same. Each group will have to hand in a report of the practices where all the calculations made are recorded, as well as the discussion and justification of the final results.

The tutored work will be graded (50/50) by the teacher and by thestudents (compulsory activity).

The calification obtained in the laboratory practices, in the seminar and in the tutored work will be kept for the 2nd call.

Only the calification obtained in the laboratory practicals and the tutored work will be retained for the following exams.

#### • Global Evaluation Mode.

The student who chooses this modality will have to do the laboratory practices and will take an exam on the same on the official date and whose maximum valuation will be of 20%. The remaining 80% will be assessed on the basis of an exam (on the official date) on the theoretical and practical part(divided according to the two partial parts), having to obtain a minimum of 5 points out of 10, both in theory and in practice, as well as a minimum score intheory in each of the Didactic Units.

## END OF COURSE EXAMINATION

The student who chooses to take the final exam will be evaluated only with the exam (which will be worth 100% of the grade) and where there will be questions related to theory, laboratory practices and numerical problem solving. In case of not attending said exam or not passing it, he/she will be valuated in the same way as the rest of the students.

#### **OFFICIAL EXAM DATES**

End of Course: 19-September-2023 (16 h).

1st Edition: 3-April-2024 (10 h).

2nd Edition: 3-July-2024 (10 h).

In case of error in the transcription of the exam dates, the valid dates are those officially approved and published on the bulletin board and on the Center's website.

| Sources of information  |
|---|
| Basic Bibliography  |
| Olsen, E.D., Métodos ópticos de análisis, Reverté, S.A., 1986   |
| Harris, D.C., Análisis químico cuantitativo, 2ª, Reverté, S.A., 2001  |
| Harris, D.C., <b>Análisis químico cuantitativo</b> , 3ª, Reverté, S.A., 2007  |
| Harvey, D., <b>Química Analítica moderna</b> , McGraw-Hill, Interamericana de España, 2002                                  |
| Valcárcel, M. y Gómez, A., Técnicas analíticas de separación, Reverté, S.A., 1988   |
| Hargis, L.G., Analytical chemistry: principles and techniques, Prentice Hall, 1988  |
| Skoog, D.A., West, D.M., Holler, F.J. y Crouch, S.R., <b>Fundamentos de Química Analítica</b> , 8ª, Thomson-Paraninfo, 2011 |
| Skoog D.A, Holler F.J., Crouch S.R., Principios de Análisis Instrumental, Cengage Learning, 2008                            |
| Complementary Bibliography  |

Recommendations