UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
Calea Mănăştur 3-5, 400372, Cluj-Napoca
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No._____of _____ **USAMV form 0703010109**

SUBJECT OUTLINE

1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca
1.2. Faculty	Food Science and Technology
1.3. Department	Food Science
1.4. Field of study	Food Engineering
1.5.Education level	Bachelor
1.6. Specialization/ Study programme	Food Engineering
1.7. Form of education	Full time

2. Information on the discipline

2.1. Name of the discipline	**Inorganic chemistry and analytical chemistry 2**							
2.2. Course coordinator	**Prof. dr.Edward Ioan Muntean**							
2.3. Laboratory coordinator	**Prof. dr.Edward Ioan Muntean**							
2.4. Year of study	**I**	2.5. Semester	**2**	2.6. Type of evaluation	Summative	2.7. Discipline status	Content[2]	**FD**
							Compulsoriness[3]	**CD**

3. Total estimated time (teaching hours per semester)

3.1. Hours per week – full time programme	4	out of which: 3.2. lecture	2	3.3. seminar/ laboratory	2
3.4. Total number of hours in the curriculum	56	Out of which: 3.5.lecture	28	3.6. seminar/laboratory	28
Distribution of the time allotted					hours
3.4.1. Study based on book, textbook, bibliography and notes					15
3.4.2. Additional documentation in the library, specialized electronic platforms and field					14
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					5
3.4.4. Tutorials					5
3.4.5. Examinations					3
3.4.6. Other activities					2
3.7. Total hours of individual study	44				
3.8. Total hours per semester	100				
3.9. Number of credits[4]	4				

4. Prerequisites

4.1. curriculum-related	• Inorganic chemistry and analytical chemistry 1 • Fundamental knowledge of inorganic chemistry, organic chemistry, physical chemistry, physics and algebra - according to high school curricula.
4.2. skills-related	• Handling of laboratory glassware and analytical reagents. • Inorganic qualitative analysis. • Teamwork, oral and written communication in Romanian • Carrying out practical work using the instructions from the Practical work guide • Digital competencies - use of information technology for word processing, data processing (spreadsheets and graphical representations) and documentation using the Internet

5. Conditions

5.1. for the lecture	▪ Academic discipline requires compliance with the start and end of the course. ▪ Other activities during the lectures are not allowed; mobile phones will be turned off. ▪ The course is interactive, students can ask questions regarding the content of the lecture. ▪ The classroom must be equipped with a blackboard, a computer, a video projector and a projection screen. ▪ Attendance required: min. 50% of the number of courses
5.2. for the seminar/ laboratory	▪ Punctuality, wearing protective equipment (white coat), compliance with the academic discipline, the norms of technique and safety of workers and those of prevention and extinguishing of fires are compulsory on the whole duration of the practical works. ▪ During practical works it is mandatory the prior reading of the Practical works' guide; students will carry out individual activities with the materials provided, according to the instructions from the guide. ▪ The laboratory must be equipped with a blackboard, analytical reagents, laboratory utensils, glassware, equipment and specific apparatuses. ▪ Attendance required: 100% (absences will be recovered!)

6. Specific competencies acquired

Professional competences	▪ C1.1. To describe and use basic concepts, theories and methods in inorganic chemistry and analytical chemistry, related to the structure, properties and transformations of food components and contaminants. ▪ C1.2. To explain and interpret concepts, processes, models and methods in inorganic chemistry and analytical chemistry, using basic knowledge on the composition, structure, properties and transformations of food components. ▪ C1.3. To identify the specialized terminology regarding the quality of food products in order to collaborate with the responsible institutions in the field of food quality and safety. ▪ C1.4. To evaluate the qualitative and quantitative characteristics, the performances and the limitations of the analytical processes applied in the agri-food chain. ▪ C1.5. To perform critical analysis, evaluation of the characteristics, performances and limits of some analytical processes and some laboratory equipment in the agri-food industry.
Transversal competences	▪ CT1. Efficient use of various ways and techniques of learning-training for the acquisition of information from bibliographic and electronic databases, both in Romanian and in a language of international circulation. ▪ CT2. Applying interrelationship techniques within a team, amplifying and refining the empathic capacities of interpersonal communication and assuming specific tasks in carrying out group activity to resolve conflicts, as well as optimal time management.

7. Course objectives (based on the list of competencies acquired)

7.1. Overall course objective	To acquaint students with the fundamental concepts, processes and methods of classical analytical chemistry, with the principles of instrumental analysis methods and main working techniques, by exposing and explaining specific theories, phenomena, processes and methods, concerning the structure, properties and transformations of some inorganic chemicals of interest for the food industry and by exposing the principles underlying the operation of apparatus used in instrumental analysis, thus accomplishing the necessary foundation for approaching the second module of this discipline and the technological disciplines of the following years.
7.2. Specific objectives	▪ To train and develop exploration, observation and experimentation skills through the use of specific reagents, equipment, devices, utensils and operations. ▪ To initiate students in performing qualitative chemical analyses through their involvement in identifying relevant ions in the composition of food products. ▪ To ensure the concepts and abilities necessary to solve the computing applications in the laboratory activity. ▪ To create adequate conditions for stimulating teamwork. ▪ To form a deontological attitude regarding the informational impact of the qualitative chemical analysis. ▪ To develop the scientific curiosity specific to a researcher, the analytical rigour and the scientific exigency. ▪ To empower and involve students individually in approaching current and future scientific issues by including them in research activities.

8. Content

8.1. LECTURE **Number of hours –28**		Teaching methods	Notes 1 lecture = 2 hours
1.	Classification of quantitative methods of analysis. Statistical treatment of analytical data.	Lecture Explication Modelling Exercise Problem-solving	2 hours
2.	Gravimetry: general principles, working technique.		2 hours
3.	Volumetry: general principles, working technique, standard substances.		2 hours
4.	Volumetry by acid-base reactions. Acid - basic indicators. Applications.		2 hours
5.	Volumetry by precipitate formation reactions. Indicators. Argentometry. Applications.		2 hours
6.	Volumetry by redox reactions. Redox indicators. Permanganatometrie. Iodometry. Bicromatometrie. Applications.		2 hours
7.	Volumetry based on reactions with the formation of complex combinations. Applications.		2 hours
8.	Electrochemical methods of analysis. Electrogravimetry. Potentiometry. Polarography. Applications		2 hours
9.	Optical methods of analysis. Turbidimetry. Refractometry. Polarimetry.		3 hours
10.	Ultraviolet-visible absorption spectrometry: principles, instruments, applications.		
11.	Chromatographic methods of analysis general principles, working techniques.		2 hours
12.	Gas chromatography. Liquid chromatography: planar chromatography, column chromatography, high performance liquid chromatography: apparatus, working techniques. Applications		4 hours

8.2. PRACTICAL WORK **Number of hours – 28**	Theoretical presentation of practical works	1 lab work = 2 hours
Volumetric analysis: preparation of standard solutions, volume measurement, titration technique, calculation and interpretation of results. Statistical interpretation of analytical data.	Explication Heuristic conversation Demonstration The exercise	2 hours
Acidimetry. Standardization of a solution of H_2SO_4 ~ 0.1 N using a standard solution of Na_2CO_3.	Demonstration Practical work	2 hours
Alcalimetry. Standardization of a NaOH ~ 0.1 N solution using a standard solution of oxalic acid. Determination of acetic acid content in vinegar.	Demonstration Practical work	2 hours
Acid-base titration curves. Choice of indicators in acid-base titration	Explication Heuristic conversation The exercise	2 hours
Bicromatometry. Preparation of a standard solution of potassium dichromate ~ 0.1 N and determination of its titer and factor. Bicromatometric determination of Fe^{2+}.	Demonstration Practical work	2 hours
Permanganatometry. Standardization of a solution of $KMnO_4$ ~ 0.1 N using a standard solution of oxalic acid. Determination of Fe^{2+} content in ferrous salts.	Demonstration Practical work	2 hours
Iodometry. Standardization of a solution of iodine ~ 0.01 N using a titrated solution of sodium thiosulfate. Iodometric determination of chlorine in drinking water.	Demonstration Practical work	2 hours
Argentometry. Standardization of an $AgNO_3$ solution ~ 0.01 N using a standard solution of NaCl. Determination of NaCl content in brine by Mohr method.	Demonstration Practical work	2 hours
Complexometry. Preparation of a solution of complexon III ~ 0.01 N and establishing its titer and factor. Complexometric dosing of Ca^{2+}.	Demonstration Practical work	2 hours
Potentiometry: pH measurement, potentiometric titration.	Demonstration Practical work	2 hours
Optical methods: refractometry, polarimetry	Demonstration Practical work	2 hours
Spectrophotometric determination of Fe^{3+}.	Demonstration Practical work	2 hours
Separation of food colours by thin-layer chromatography.	Demonstration Practical work	2 hours
Colloquy	Practical evaluation	2 hours

Compulsory bibliography:

1. Muntean, E., 2007, Chimie analitică şi analiză instrumentală. Editura AcademicPres Cluj Napoca.

2. Muntean, E., 2006, Chimie analitică şi analiză instrumentală: tehnici de lucru şi aplicaţii de calcul. Editura AcademicPres Cluj Napoca.

Optional bibliography:

1. Luca C., A.Duca, A.Crişan, 1983, Chimie analitică şi analiză instrumentală. Ed. Didactică şi Pedagogică, Bucureşti.
2. Pietrzyk D.J., W.Frank, 1989, Chimie analitică. Editura Tehnică, Bucureşti.
3. Rădulescu G., M.I.Moise, I.Ceteanu, 1997, Chimie analitică calitativă. Editura Didactica şi Pedagogică Bucureşti.

9. Corroborating the course content with the expectations of the epistemic community representatives, of the professional associations and the relevant stakeholders in the corresponding field

The disciplines of Inorganic Chemistry and Analytical Chemistry have the role of providing students with theoretical knowledge and practical skills with which they can justify and control aspects related to the nature and properties of raw materials/ their processes of transformation into finished products. The activities carried out by the students aim at developing the capacities of individual work, of analysis and interpretation of the results, of the capacity to offer solutions to some practical problems.

The content of the disciplines is in accordance with what is studied in other universities with similar specializations in the country and abroad. To adapt to the requirements of the labour market, the proposals of the graduates of the Faculty of Food Science and Technology working in the field were taken into account when drawing up the subject outline. By mastering the theoretical and methodological concepts and by approaching the practical aspects involved by these disciplines, students acquire an adequate body of knowledge, by the skills required for the occupations provided in RNCIS.

10. Assessment

Type of activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade
10.4. Lecture	The level of knowledge assimilation. Correctness of answers, acquisition and understanding of the addressed issues. Logical coherence	Written exam	70%
10.5. Seminar/ Laboratory	Solving the calculation applications, the quality of the activity carried out. Ability to analyze and interpret results	Continuous evaluation Practical evaluation	30%
10.6. Minimum performance standards			
- solving simple problems based on given algorithms; - carrying out a project in a team - dosing of a substance from a sample; - elaboration of a study by using relevant documentation resources (including internet, databases, online courses, etc.); - description of the behaviour of the chemical species studied in a given context; - the correct naming of the studied substances, according to the IUPAC requirements; - identification of the stages of performing some experimental, laboratory activities; - the correct use of laboratory apparatus and equipment; - proper reporting of the experimental observations in the form of tables, graphs, diagrams.			

[1] Level of study- to be chosen one of the following - Bachelor/Postgraduate/Doctoral

[2] Course regime (content) – for bachelor level will be chosen one of the following - **DF** (fundamental subject), **DD** (subject in the domain), **DS** (specific subject), **DC** (complementary subject).

[3] Course regime (compulsory level) - to be chosen one of the following - **DI** (compulsory subject), **DO** (optional subject), **DFac** (facultative subject)

[4] One ECTS is equivalent with 25-30 de hours of study (didactical and individual study).

Filled in on
06.09.2021

Course coordinator
Prof.dr.ing. Edward Ioan Muntean

Laboratory work/seminar coordinator
Prof.dr.ing. Edward Ioan Muntean

Subject coordinator
Prof.dr.ing. Edward Ioan Muntean

Approved by the
Department on
22.09.2021

Head of the Department
Prof. dr.Ramona Suharoschi

Approved by the Faculty
Council on
28.09.2021

Dean
Prof. dr. Elena Mudura