

Course Syllabus**I. General Information**

Course name	Chromatographic techniques
Programme	Biotechnology
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BSc
Form of studies (full-time, part-time)	part-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	
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Type of class (<i>use only the types mentioned below</i>)	Number of teaching hours	Semester	ECTS Points
lecture			3
tutorial			
classes	30	II	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Basic knowledge of chemistry, physico-chemistry of biological systems, within the ranges accepted in the standards of education for these items. Ability for laboratory work according to health and safety procedures.
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II. Course Objectives

Acquiring the students with terminology used in chromatographic techniques.
Acquainted with the possibilities of using chromatographic techniques in a variety of analytical tests.
Acquisition by students of basic, practical skills of work with chromatography systems.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	The student knows and describes the basic physical and chemical laws necessary to understand natural phenomena and processes and used in chromatography.	K_W02
W_02	The student is able to compare the various chromatography techniques and indicate their use in the study of biotechnological processes.	K_W05
W_03	The student has knowledge of safety rules in the laboratory and work in a team.	K_W09
SKILLS		
U_01	The student uses selected chromatographic techniques, can indicate their possibilities and limitations.	K_U01
U_02	The student is able to interpret the results obtained from the performed chromatographic measurements and make their critical analysis.	K_U02
U_03	The student designs, prepares and carries chromatographic analysis used to evaluate biological processes.	K_U15
U_04	The student understands the need to continuously deepen and update their knowledge and skills in the field of chromatographic techniques, their use and modification. He/she shows openness to new solutions and opportunities offered by chromatography in biotechnology.	K_U17
SOCIAL COMPETENCIES		
K_01	Student demonstrates care for the workplace, entrusted equipment, willingness to work in a group with respect to the work of others and their own.	K_K04
K_02	The student behave in the laboratory in accordance with the principles of safety and hygiene of work. It has habits adequate to behave and work in laboratory.	K_K04

IV. Course Content

Introduction to classes, health and safety rules in force in the laboratory, the general requirements and conditions for completion of the exercise. A brief historical chromatography division of chromatographic methods, the basic concepts, terminology, definitions and construction of the chromatographic system, qualitative and quantitative analysis. Calibration methods and comparison of their accuracy. Optimization of the chromatographic separation, the basic analytical problems and the methods of dealing with them. Determination of the respiration activity of the microorganisms by gas chromatography. Qualitative and quantitative analysis of the alcohols using GC/MS. The use of liquid chromatography (HPLC) to determine the amount of caffeine in the beverages.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods <i>(choose from the list)</i>	Forms of assessment <i>(choose from the list)</i>	Documentation type <i>(choose from the list)</i>
KNOWLEDGE			
W_01	Laboratory analysis	Written test	Completed and evaluated test
W_02	Laboratory analysis	Written test	Completed and evaluated test
W_03	Laboratory analysis	Observation	Rating card
SKILLS			
U_01	Laboratory classes	Observation Report	Rating card, Report printout / Report file
U_02	Practical classes	Report	Report printout / Report file
U_03	Laboratory classes	Observation Report	Rating card, Report printout / Report file
U_04	Practical classes	Report	Report printout / Report file
SOCIAL COMPETENCIES			
K_01	Laboratory classes	Observation	Rating card
K_02	Laboratory classes	Observation	Rating card

VI. Grading criteria, weighting factors.....

Classes: Partial colloquia (3 per semester) - 90%, written reports on the exercises and timeliness of their submission - 10%

Mark	Evaluation criteria	
very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 91-100%
over good (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 86-90 %
good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 71-85%
quite good (3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 66-70%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 51-65%

insufficient (2)	the student accomplishes the assumed learning outcomes at an insufficient level	the student demonstrates knowledge of the education content below the level of 51%
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VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	30
Number of hours of individual student work	45

VIII. Literature

Basic literature
Scot R.P.W., Principles and practice of chromatography, 2003 Poole C.F., Gas chromatography, Elsevier Inc., 2012 Braithwaite A., Smith F.J., Chromatographic methods, 5th edition, Kluwer Academic Publisher, 1999 Fanali S., Haddad P.L., Poole C.F., Schoenmakers P., Lloyd D., Liquid chromatography, Fundamentals and Instrumentation, Elsevier Inc., 2013
Additional literature
Dhanarasu S. (ed) Chromatography and its applications, InTech, 2012 Higson S., Analytical chemistry, Oxford University Press, 2001 Krull I.S.(eds), Analytical Chemistry. ISBN 978-953-51-0837-5, InTech, 2012 Dolan J. A Guide to HPLC and LC-MS Buffer Selection, ACE