



# FEDERAL UNIVERSITY OF CEARÁ

## Provost Office of Research and Graduate Studies

### COURSE PROGRAM

<b>1. PROGRAM:</b>	
Program	GRADUATE PROGRAM IN CHEMISTRY
<b>2. COMPONENT TYPE:</b>	
Activity ( )	Course ( X )                      Module ( )
<b>3. LEVEL:</b>	
Master's Degree ( )                      Doctorate ( )	
<b>4. COMPONENT IDENTIFICATION:</b>	
Name:	ELECTROMETRICS AND CHROMATOGRAPHICS METHODS
Code:	CEP9566
Hours:	128
Credits:	8
Optional course:	Yes ( X )                      No ( )
Compulsory course:	Yes ( )                      No ( X )
Area:	Inorganic Chemistry
<b>5. PROFESSOR:</b>	
Eduardo Henrique Silva de Sousa Luiz Gonzaga de França Lopes Izaura Cirino Nogueira Diógenes	
<b>6. ABSTRACT:</b>	
Present to the students the fundamentals of two key techniques for use in their scientific work, thus introducing the fundamentals of various electrochemical techniques (cyclic voltammetry, square wave voltammetry, pulse, polarography, etc.), maintaining a practical / experimental focus. Similarly, introduce fundamentals of separation methodologies, throughout chromatographic methods (GG and HPLC), instrumentation and experimental optimizations.	
<b>7. COURSE PROGRAM:</b>	
<ol style="list-style-type: none"> <li>1. Fundamental Concepts of Electrochemistry (Reactions of oxidation and reduction. Electrochemical cells (thermodynamics and kinetics).</li> <li>2. Electrochemical Techniques (Voltammetry, Chronopotentiometry, Chronoamperometry, Spectroelectrochemistry, Impedance, Polarography, Rotating Electrode)</li> <li>3. Experimental Aspects (Determination of the diffusion coefficient of metal complexes. Determination of voltammetric parameters: peak current and potential, half-wave potential and analysis of the reversibility of the electrochemical reaction. Oxidation and Electrochemical Reduction of metal complexes by cyclic voltammetry. Electroanalytical study of modified electrodes).</li> <li>4. Introduction to Separation Methods (principles of partition and adsorption, types of chromatography: liquid and gas)</li> <li>5. Thin Layer Chromatography (principles, equipment and materials, types of resins available, detection, case examples).</li> <li>6. Gas Chromatography (principles, types of columns, equipment and detectors).</li> </ol>	

7. Liquid chromatography (principles of ion exchange separation, partition, hydrophobic and polar interactions, gel exclusion; types of resins and their use in gravity (flash) and high pressure systems, historical evolution of HPLC, columns for HPLC, equipment and detectors, case examples).

8. Experimental activity using HPLC or GC.

#### 8. EVALUATION PROCESS:

Tests, seminars

Frequency equal to or greater than 75%

#### 9. BIBLIOGRAPHY:

##### Basic

1. Bard, J.A.; Faulkner, L.R.; *Electrochemical Methods, Fundamentals and Applications*, 2<sup>nd</sup> ed., Wiley, Estados Unidos, 2000.
2. Kissinger, P.T.; Heineman, W.R.; *Laboratory Techniques in Electroanalytical Chemistry*, 2<sup>nd</sup> ed., Marcel Dekker, Estados Unidos, 1996.
3. Greef, R.; Peat, R.; Peter, L.M.; Pletcher, D.; Robinson, J.; *Instrumental Methods in Electrochemistry*, John Wiley & Sons, Estados Unidos, 1985.
4. Sawyer, D.T.; Sobkowiak, A; Roberts, J.L.; *Electrochemistry for Chemists*, 2<sup>nd</sup> ed., John Wiley & Sons, Estados Unidos, 1995.
5. Zanello, P.; *Inorganic Electrochemistry, theory, practice and application*, Royal Society of Chemistry, 2003.
6. Compton R.G., Banks C.E., *Understanding cyclic voltammetry*, Imperial College Press, 2<sup>nd</sup> ed., 2011.

##### Complementar

1. Poole, C. F., *The essence of chromatography*, Elsevier, 2003.
2. McMaster, Ma. C., *HPLC - a practical user's guide*, 2<sup>nd</sup>. Ed, Wiley Interscience, 2007.
3. Ettre, L. S., *Chromatography: the Separation Technique of the 20<sup>th</sup> Century*, *Chromatographia* 2000, 51 (1-2), 7-17.
4. Snyder, L. R., *Modern Practice of Liquid Chromatography – before and after 1971*, *Journal of Chemical Education* 1997, 74(1), 37.
5. Artigos científicos.