COURSE SYLLABUS

COURSE NAME:
Electroanalytical Chemistry (Che 549) (Monday 6:40 PM – 9:00 PM)

INSTRUCTOR:
Dr. R. M. Ianniello

LECTURE/LAB HOURS:
3 Lecture hours

CREDITS:
3

PREREQUISITES:
Quantitative Analysis and Instrumental Methods of Analysis

COURSE DESCRIPTION:
This course will discuss the theory and instrumental techniques that encompass static and dynamic electroanalytical measurements. Topics will include potentiometry, voltammetry, coulometry, basic instrumentation/operational amplifiers, and new applications. Focus will be on analytical applications and utilizing the correct technique for solving specific analysis problems.

COURSE OBJECTIVES/STUDENT LEARNING OUTCOMES:
Students will learn the fundamental theory that supports electroanalytical measurements. Modern techniques used for chemical analysis and mechanistic studies will be presented so that real world analysis problems can be investigated.

STUDENT RESOURCES (recommended but not mandatory):
Textbooks:


Course notes will be presented in MS Powerpoint format.

Literature citations will be assigned as needed.

COURSE REQUIREMENTS:
Written homework assignments will be reviewed in lecture. Exams (midterm, final), based on lecture notes and homework assignments, will be given during the lecture timeslots. A review paper will be assigned.
EVALUATION METHODS:

Midterm exam – 35%
Final exam – 35%
Review paper – 30%

SCHEDULE OF TOPICS TO BE COVERED:

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Topics</th>
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<tbody>
<tr>
<td>1,2,3,4,5</td>
<td>Potentiometric techniques, redox potentials, Nernst equation, direct potentiometric measurements, glass electrode, liquid membrane electrode, solid state electrode, gas sensing, electrode, ISFETs, indirect potentiometric measurements, solution conductivity</td>
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<tr>
<td>6,7</td>
<td>Theoretical considerations, structure of the electrical double layer, diffusion, effect of current passage in electrochemical cells, ohmic potential and IR drop, concentration polarization, kinetic polarization</td>
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<td>8</td>
<td>Midterm exam, assign review paper topics</td>
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<tr>
<td>9,10,11,12</td>
<td>Controlled potential techniques, dc polarography, ac polarography, differential pulse polarography, square wave voltammetry, stripping voltammetry, linear sweep voltammetry, cyclic voltammetry, hydrodynamic (rotating disk) voltammetry, controlled potential coulometry, electrochemical impedance spectroscopy</td>
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<tr>
<td>13</td>
<td>Operational amplifier circuits, potentiostats, practical considerations</td>
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<td>14</td>
<td>Hybrid electrochemical techniques, ultramicroelectrodes, liquid chromatography with electrochemical detection, electrochemical quartz crystal microbalance, scanning electrochemical microscope, batteries, fuel cells</td>
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<tr>
<td>15</td>
<td>Final exam</td>
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