

# CURRICULUM PROPOSAL FORM

**EADLINES:**

REGULAR COURSE PROPOSALS: OCTOBER 23, 1998 FOR FALL, 1999 AND FEBRUARY 19, 1999 FOR SPRING, 2000  
SHORT-TERM COURSE PROPOSALS: DECEMBER 11, 1998 FOR FALL, 1999 AND MARCH 26, 1998 FOR SPRING 2000

**PROPOSAL TITLE:** *Electrochemical Engineering 0906. 568*

**SPONSOR/S:** *Dr. Robert P. Hesketh and Chemical Engineering Cur. Com.*

**DEPARTMENT:** *Chemical Engineering*

**CHECK ALL THAT APPLY:**

UNDERGRADUATE       GRADUATE

**COLLEGE:** \_\_\_\_\_

If LAS:     History/Humanities  
               Math/Sciences  
               Social/Behavioral Sciences

\* \* \* \* \*

**TYPE OF PROPOSAL (Check ALL that Apply)**

<input type="checkbox"/> General Education	<input checked="" type="checkbox"/> New Course (NOT Gen. Ed.)
<input type="checkbox"/> <i>New Course in _____ Bank</i>	<input type="checkbox"/> Name Change (Dept., School, Major)
<input type="checkbox"/> Existing course, Add To _____ Bank	<input type="checkbox"/> Changes in Degree Requirements
<input type="checkbox"/> Multicultural/Global Designation	<input type="checkbox"/> <i>Changes Involve Gen. Ed. requirements</i>
<input type="checkbox"/> Writing Intensive Designation	<input type="checkbox"/> Minor Changes to Existing Courses
<input type="checkbox"/> New Minor/Concentration/Specialization	<input type="checkbox"/> <i>Course is NOT General Education</i>
<input type="checkbox"/> New Major/Degree Program	<input type="checkbox"/> <i>Course IS General Education</i>
<input type="checkbox"/> Short Term Course Proposal	

**DEPARTMENT**  
(SIGNATURE INDICATES APPROVAL)

*Robert P. Hesketh*    *10/19/98*      *[Signature]*    *10/19/98*

DEPT. CURRICULUM CHAIR / DATE      DEPT. CHAIRPERSON / DATE

**COLLEGE CURRICULUM COMMITTEE**  
DATE OF OPEN HEARING (if necessary): *2/9/99*

APPROVED  
 NOT APPROVED

COMMENTS:

*Robert P. Hesketh*    *2/9/99*  
SIGNATURE                      DATE

**ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)**

APPROVED  
 NOT APPROVED

COMMENTS:

*[Signature]*    *10/23/98*  
SIGNATURE (Academic Dean)    DATE

\_\_\_\_\_  
SIGNATURE (Graduate Dean)    DATE

**UNIVERSITY CURRICULUM COMMITTEE**

DATE OF OPEN HEARING (if necessary) 2/9/99 (College level only)

APPROVED

NOT APPROVED

COMMENTS:

Deanna Reeves  
SIGNATURE

3/4/99  
DATE

**SENATE**

Date announced at Senate 2/23/99

Voted upon at Senate:

Approved

Not Approved

Date:

**EXECUTIVE VICE PRESIDENT/PROVOST**

APPROVED

NOT APPROVED If no, reasons are as follows:

STUDENT CREDIT HOURS \_\_\_\_\_ FACULTY LOAD HOURS \_\_\_\_\_ EQUALIZED CREDIT HOURS \_\_\_\_\_

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): \_\_\_\_\_

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST

*[Handwritten Signature]*

**REGISTRAR**

DATE APPROVED COURSE DESCRIPTION RECEIVED \_\_\_\_\_

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED 0900.500

DATE/SIGNATURE OF REGISTRAR Robert A. Kubot 3/25/99

**NOTIFICATION FORWARD:**

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSONS

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

*[Handwritten: Tim 3/21/99]*

## *Course Proposal*

### *1. Details:*

<b>a) Course Title:</b>	Electrochemical Engineering (0906.568)
<b>b) Sponsor:</b>	Robert P. Hesketh and the Chemical Engineering Curriculum Committee
<b>c) Credit Hours:</b>	3 credit hours
<b>d) Course Level:</b>	Graduate
<b>e) Curricular Effect:</b>	Technical Elective for engineering graduate students
<b>f) Prerequisites:</b>	Graduate standing and approval of Graduate Advisor
<b>g) Suggested Time/ Scale of Implementation:</b>	Fall 1999 1 section
<b>h) Resources:</b>	Faculty will be hired consistent with the College of Engineering multi-year budget. No computer software beyond what is currently being acquired for approved course will be necessary. Laboratory equipment will be obtained consistent with the College of Engineering capital budget. Library acquisitions will be required consistent with current acquisition plan.

### *2. Rationale:*

The proposed course is a graduate elective in the College of Engineering and is consistent with the establishment of the College of Engineering approved by the Board of Trustees in February 1995.

The course will address the area of electrochemical engineering that is important multidisciplinary topic relevant to many areas of engineering and science. The course will describe the basic principles of electrochemical engineering and applications to energy storage, industrial electrolysis and corrosion, and design of electrochemical systems.

### *3. Essence of the Course:*

#### **a) Objectives:**

Upon completion of the course, students will be able to:

1. Understand the fundamentals of thermodynamics, kinetics and mass transfer as related to process electrochemistry
2. Model and simulate electrochemical processes, e.g., electrochemical cells.
3. Apply electrochemical principles to corrosion and corrosion prevention systems.

4. Understand electrochemical principles applied in commercial design case studies such as electric vehicles, microscale devices, chlor-alkali process.
5. Use computer software to analyze electrochemical engineering problems.
6. Work in teams to solve open-ended design problems.

**b) Topical Outline:**

The topics to be covered are listed below. The instructor will supply the students with a syllabus during the first week of classes. The instructor will assess any technology advances in the subject matter prior to the course and make topic changes as deemed appropriate to maintain the level and currency of instruction.

Introduction to electrochemical engineering

- Major applications
- Historical developments

Basic concepts

- Faraday's law
- Current and voltage efficiency
- Ion conductance
- Transference numbers

Cell thermodynamics

- Nernst equation
- Pourbaix diagram
- Equilibrium constant

Phase equilibrium

- Electrochemical potential
- Activity coefficients
- Debye-Huckel theory
- Potential in solution
- Liquid-junction potential

Electrode kinetics

- Electric double layer
- Electrode kinetics model
- Reference electrodes
- Mechanistic studies
- Corrosion process

Ionic mass transfer

Mass transfer boundary layer

Concentration over-potential

Limiting current density

Modeling and simulation of electrochemical processes

General systems modeling

Current distribution characteristics

Electrochemical cell simulation

Gas-evolving electrodes

Commercial Applications

Energy storage and conversion -

Electric vehicles, fuel cells, microscale devices

Electrolytic processes -

Electrochemical reactors, chlor-alkali processes, electromembrane separations

Novel / hybrid systems

**c) Evaluation and Grading Procedure of Students:**

Student grades will be based on examinations, homework and a required project. A course syllabus with a stated method of arriving to the final grade, e.g., number of exams, projects, homework, percentage of grade, will be distributed to students the first week of classes.

**d) Course Evaluation:**

The proposed course will be evaluated on the basis of student evaluations and curriculum review by appropriate faculty.

**4. Results of Consultations:**

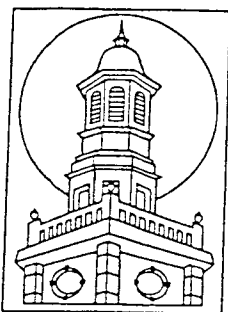
Consultations have been made with Chemistry faculty in the Department of Chemistry and Physics who have provided a letter of support.

### ***Catalog Description***

#### **Electrochemical Engineering (0906.568)**

*Prerequisite: Graduate standing and approval of Graduate Advisor*

This course will focus on the fundamental principles of process electrochemistry. Basic principles of thermodynamics, kinetics and mass transfer as applied to electrochemical systems will be presented. Modeling of electrochemical systems and application of electrochemical principles to corroding systems will be conducted by the students. Engineering case studies of commercial applications in energy conversion and storage and electrolytic processes will be presented.



Rowan College of New Jersey

Glassboro, NJ 08028-1701 • 609/256-4855

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*Department of Chemistry and Physics*

To: Curriculum Committee  
From: Robert Newland, Chairperson  
Subject: Chemical Engineering Technical Electives  
Date: February 15, 1996

A handwritten signature in black ink, appearing to read 'RN', positioned to the right of the recipient information.

I have examined the course proposals listed below and find them in accord with the previously submitted curriculum plan. I also have noted where courses require chemistry and /or physics prerequisites and am convinced there are no additional resources required to meet this demand for our courses. We fully support these proposals.

Electrochemical Engineering  
Environmental Regulations in Technology Industries  
Environmental Considerations in Process Design  
Process Safety  
Membrane Process Technology  
Advanced Separation Technology  
Process Heat Transfer  
Fluid Flow in Processing and Manufacturing  
Advanced Reactor Design  
Bioprocess Engineering  
Transport Phenomena