

المملكة العربية السعودية وزارة التعليم جامعة أم القرى عمادة الدراسات العليا

COURSE SPECIFICATIONS Form

Course Title: Electroanalytical Chemistry

Course Code: 4026844-3





المملكة العربية السعودية وزارة التعليم جامعة أم القرى عمادة الدراسات العليا

Date: 29-10-2018

Institution: Umm Al-Qura University.

College: Faculty of Applied Science

Department: Department of Chemistry

A. Course Identification and General Information

| 1. Course title and code: Electroanalytical Chemistry / 4026844-3 | | | | | |
|---|---|------------------|------------|--|--|
| 2. Credit hours: 3 hrs.(Theoretical) | 2. Credit hours: 3 hrs.(Theoretical) | | | | |
| 3. Program(s) in which the course is offered | d. M. Sc. in (| Chemistry | | | |
| 4. Name of faculty member responsible for | the course: | Dr. Mohammed Ah | med Kassem | | |
| 5. Level/year at which this course is offered | d: 3 rd / 2 nd | | | | |
| 6. Pre-requisites for this course (if any): not | t applicable | | | | |
| 7. Co-requisites for this course (if any): not | applicable | | | | |
| 8. Location if not on main campus: El-Abed | yah, El-Azizy | ya, and El-Zaher | | | |
| 9. Mode of Instruction (mark all that apply) | : | | | | |
| a. Traditional classroom | | percentage? | | | |
| b. Blended (traditional and online) | | percentage? | 80% | | |
| c. E-learning | | percentage? | 20% | | |
| d. Correspondence | | percentage? | | | |
| f. Other | | percentage? | | | |
| Comments: | | | | | |



B Objectives

1. The main objective of this course

By the end of this course, students able to understand the fundamental principles of electrochemistry and electrochemical methods of analysis. Also, The student will learn about the theoretical aspects of electrochemical measurements whether they are used for determining some physical properties of a system or for detecting an analyte.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- The use of smart teaching halls for lectures.
- Encourage students to carry out research reports in the advance physical chemistry related subjects using the library, data base services, and/or websites.
- Changes in content as a result of new research in the field.
- Increased use of IT or web based reference material.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

| 1. Topics to be Covered | | |
|---|-------------------|------------------|
| List of Topics | No. of Weeks | Contact hours |
| • The fundamental principles of electrochemistry and electrochemical methods of analysis. | 2 | 6 |
| • The theoretical aspects of electrochemical measurements whether they are used for determining some physical properties of a system or for detecting an analyte. | 2 | 6 |
| Structure of electrode interface and the diffusion. | 1 | 3 |
| Linear and cyclic voltammetry. | 2 | 6 |
| Polarography and potentiometry (ion selective electrode). | 1 | 3 |
| Potential step methods and Differential- and square-wave. | LOURA UUIVERSITY. | 3 |
| Stripping voltammetry, coulometry, conductometric and amperometric analysis. | | 6 |



| Hydrodynamic voltammetry, rotating electrode | technique dura university 1 | 3 |
|--|-----------------------------|---|
| | The star a star | |
| Electrochemical impedance spectroscopy. | | 3 |
| | | |
| | CL CF CHERE CH | |

| 2 Cours | 2. Course components (total contact and credit hours per semester): | | | | | | |
|----------|---|---------|----------|-----------------------|-----------|-------|-------|
| 2. Cours | e compon | Lecture | Tutorial | Laboratory/ Studio | Practical | Other | Total |
| Contact | Planned | 39 | | | | | 39 |
| Hours | Actual | 3 | | | | | 3 |
| Credit | Planned | 39 | | | | | 39 |
| | Actual | 3 | | | | | 3 |

3. Individual study/learning hours expected for students per week.

2 Hrs.

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

| | Curriculum Map | | | | | | |
|------|---|--|-------------------|--|--|--|--|
| Code | NQF Learning Domains | Course Teaching | Course Assessment | | | | |
| # | And Course Learning Outcomes | Strategies | Methods | | | | |
| 1.0 | Knowledge | | | | | | |
| 1.1 | Understand the fundamental principles of | Lectures | •Written mid- | | | | |
| | electrochemistry and electrochemical | Scientific discussion | term and final | | | | |
| | methods of analysis. | Use the library to | exams. | | | | |
| 1.2 | • Describe thestructure of electrode interface. | work duties and a | •Long and short | | | | |
| 1.3 | Write about polarography and potentiometry. | small research on electroanalytical | essays. | | | | |



| 1.4 • Identity interference as precision • Uternistry. 1.5 • Explain scientific basis of the hydrodynamic voltammetry. • Use of the internet to carry out some reports on course subjects. 1.6 • Outline the rotating electrode technique and electrochemical impedance spectroscopy. • Scientific discussion 1.7 • Recording the relation betweendifferential-and square-wave voltammetry. • Mid-term and final exams. 1.8 • Compare between Linear and cyclic voltammetry. • Mid-term and final exams. 2.1 • Interpret the theoretical aspects of electrochemical measurements whether they are used for determining some physical property a system or for detecting an analyte. • Mid-term and final exams. 2.2 • Discoverthe potential step methods. • Using brain assignments. 2.3 • Apply a rotating electrode technique. • Scientific discussion signments. 2.4 • Modify the electrochemical impedance spectroscopy. • Using brain assignments. 2.5 • Formulate the relation linear and cyclic voltammetry. • Scientific discussion discussin discussion discussion discussion discussion | 1.4 | | Chamistry | |
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| 3.2 • Choose the suitable method to solve out collective collective | 3.1 | Operate in team work and accept his | Dividing students | • Evaluate the |
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| problems. scientific reports. and duties as well | 3.2 | Choose the suitable method to solve | out collective | collective works |
| | | problems. | scientific reports. | and duties as well |



| 3.3 | Develop the student's ability in self-reliance | Periodic individual | as knowing the |
|-----|--|----------------------|---------------------|
| | and responsibility. | duties to develop | contribution of |
| | | the skill of taking | each individual |
| | | responsibility and | through dialogue |
| | | self-reliance. | and discussion. |
| | | | •Assessment of |
| | | | individual tasks |
| | | | and duties to |
| | | | determine the |
| | | | student's ability |
| | | | to self-reliance. |
| 4.0 | Communication, Information Technology, Numerical | | |
| 4.1 | Use computers and the international | Visiting research | • Evaluation of the |
| | information network (the Internet) to | centers. | duties associated |
| | perform calculations and to identify recent | • The use of | with the proper |
| | research relevant to decision sources. | computers in the | use of numerical |
| 4.2 | Communicate effectively in oral and written | training room of the | and |
| | forms. | department. | communication |
| 4.3 | Use basic mathematical and statistical | • Using the internet | skills. |
| | techniques to perform data analysis. | for collecting data. | • Web-based |
| | | | student |
| | | | performance |
| | | | systems. |
| | | | • Individual and |
| | | | group |
| | | | presentations. |
| 5.0 | Psychomotor(if any) | | |
| 5.1 | Not applicable. | | |

| 5.4 | 5. Assessment Task Schedule for Students During the Semester | | | | | |
|-----|---|----------|-----------------------------------|--|--|--|
| | Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.) | Week Due | Proportion of Total Assessment | | | |
| 1 | Assignments and activities. | | 10 % | | | |
| 2 | Midterm Exam. | 8 | 30 % | | | |



| 3 | Final Exam. | 15-16 | 60 % |
|---|-------------|-------|------|
| 4 | Total | 100 % | |

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- Office hours: During the working hours weekly.
- Academic advising for students.
- Availability of Staff members to provide counseling and advice.

E Learning Resources

- 1. List Required Textbooks
- A.J. Bard and L. R. Faulkner, *Electrochemical Methods: Fundamentals and Applications*, John Wiley and Sons., 2nd ed. 2001
- Fundamentals of Electroanalytical Chemistry, Paul M. S. Monk, Manchester Metropolitan University, Manchester, UK, 2001.
- 2. List Essential References Materials (Journals, Reports, etc.)
- Journal of Electroanalytical Chemistry.
- Journal of Analytical Chemistry.
- 3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
 - http://nsdl.niscair.res.in/jspui/
 - <u>http://www.chemistry.uoc.gr/</u>
 - http://www.chemie.uni-hamburg.de/

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

• None.

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

- 1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)
- Equipped lecture hall equipped specializing in electroanalytical chemistry.
- 2. Technology resources (AV, data show, Smart Board, software, etc.)
- Room equipped with computers, data show and TV.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- No other requirements.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

- Structured group discussions and/or focus groups.



- Questionnaires can be used to collect student feedback.
- Student representation on staff-student committees and institutional bodies.
- 2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
- The instructor's statement of his/her goals for the course, teaching methods and philosophy, student outcomes, and plans for improvement are a critical source of information.
- A systematic self-review has the potential for contributing significantly to the instructor's teaching improvement by focusing on the strengths and weaknesses of the course in light of his/her original course objectives.
- Visits by other faculty can provide information about the process of teaching.
- Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers).
- 3. Procedures for Teaching Development
- Providing new tools for learning.
- The application of e-learning.
- Exchange of experiences internal and external.
- Training programsand workshops for Staff member.
- Review of strategies proposed.

4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)

- Check marking by an independent member teaching staff of a sample of student work.
- Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

- Workshops for teachers of the course.
- Periodic review of the contents of the syllabus and modify the negatives.
- Consult other staff of the course.
- Hosting a visiting staff to evaluate of the course.

Name of Course Instructor: Dr. Mohammed Ahmed Kassem

Signature: (

Date Completed: 29 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature:

Date Received: 30/10/2018

