|  |  |
| --- | --- |
| **Course Title:** | **Various Topics in Analytical Chemistry** |
| **Course Code:** | **CHEM 650** |
| **Program:** | **1st level of PhD program** |
| **Department:** | **Chemistry** |
| **College:** | **Science** |
| **Institution:** | **King Saud University (KSU)** |

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# A. Course Identification

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1. Credit hours:** | | **2 (2+0)** | | |
| **2. Course type** | | | | |
|  | Required | | Elective | |
| **3. Level/year at which this course is offered:** | | | | **1st level in Ph.D. Program in Chemistry** |
| **4. Pre-requisites for this course** (if any)**:NA** | | | | |
| **5. Co-requisites for this course** (if any)**:NA** | | | | |
|  | | | | |

## 6. Mode of Instruction (mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage** |
| --- | --- | --- | --- |
| **1** | **Traditional classroom** |  | 80 |
| **2** | **Blended** |  | 10 |
| **3** | **E-learning** |  |  |
| **4** | **Correspondence** |  | 10 |
| **5** | **Other** |  |  |

**7. Actual Learning Hours** (based on academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Learning Hours** |
| **Contact Hours** | | |
| **1** | **Lecture** | 26 |
| **2** | **Laboratory/Studio** |  |
| **3** | **Seminars** |  |
| **4** | **Others** (specify) |  |
|  | **Total** | 26 |
| **Other Learning Hours\*** | | |
| **1** | **Study** |  |
| **2** | **Assignments** |  |
| **3** | **Library** |  |
| **4** | **Projects/Research Essays/Theses** |  |
| **5** | **Others** (specify) |  |
|  | **Total** |  |

**\*** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

# B. Course Objectives and Learning Outcomes

|  |
| --- |
| 1. Course Description In the beginning of the course, the students will have an exam on the basic principles of analytical chemistry in order to help in selecting the subjects which suitable for them. |
|  |
| 2. Course Main Objective |
| 1. Reminding students with the basic principles of analytical chemistry. 2. Providing students with the latest developments in instrumental analysis in general. 3. Involving students in a discussion concerning the current research topics in analytical chemistry. |

## 3. Course Learning Outcomes

| **Course Learning Outcomes (CLOs)** | | **Aligned****PLOs\*** |
| --- | --- | --- |
| 1 | **Knowledge** |  |
| 1.1 | Recognize the concept of chemical equilibrium and their types | K1 |
| 1.2 | Describe the aspects of quantitative spectrometric and chromatographic methods of analysis including mass spectrometry | K2 |
| 1.3 |  |  |
| 1... |  |  |
| **2** | **Skills** |  |
| 2.1 | Calculate chemical equilibrium concentrations and constants | S1 |
| 2.2 | Interpret the different spectrometric and chromatographic techniques data for identifying and determining various species | S2 |
| 2.3 | Compare between different spectrometric and chromatographic instrumental techniques | S3 |
| 2... |  |  |
| **3** | **Competence** |  |
| 3.1 | Demonstrate individual independence and group work in class | C1 |
| 3.2 | Illustrate performance in a research | C2 |
| 3.3 | Demonstrate scientific methodology in solving the research problems | C3 |
| 3... |  |  |

\* Program Learning Outcomes

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | Chemical equilibrium problems | 4 |
| 2 | Quantitative Instrumental Analysis | 4 |
| 3 | Principles and applications of mass spectrometry | 4 |
| 4 | New developments in methods of analysis particularly chromatographic and spectrometric methods | 6 |
| 5 | Evaluation of the Data obtained by the different instrumental methods according to Precision and Accuracy | 4 |
| ... | Discussions on the current research topics in analytical chemistry | 4 |
| **Total** | | 26 |

# D. Teaching and Assessment

## 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| **Code** | **Course Learning Outcomes** | **Teaching Strategies** | **Assessment Methods** |
| --- | --- | --- | --- |
| **1.0** | **Knowledge** | | |
| 1.1 | Recognize the concept of chemical equilibrium and their types | -Lectures  -Quizzes  -Presentations | -Homework assignments  -Midterm exams  -Final exam |
| 1.2 | Describe the aspects of quantitative spectrometric and chromatographic methods of analysis including mass spectrometry | -Lectures  -Quizzes  -Presentations | -Homework assignments  -Midterm exams  -Final exam |
| … |  |  |  |
| **2.0** | **Skills** | | |
| 2.1 | Calculate chemical equilibrium concentrations and constants | -Homeworks  -Using available electronic technology in teaching | -Direct questions  -Midterm and final exams  -Homework assignments |
| 2.2 | Interpret the different spectrometric and chromatographic techniques data for identifying and determining various species | -Lectures  -Quizzes | -Direct questions  -Midterm and final exams  -Quizzes assignments |
| … | Compare between different spectrometric and chromatographic instrumental techniques | -Lectures  -Quizzes | -Direct questions  -Midterm and final exams  -Quizzes assignments |
| **3.0** | **Competence** | | |
| 3.1 | Demonstrate individual independence and group work in class | Solving problems individually and with group | -Evaluating individual and group works  -Evaluating individual presentations |
| 3.2 | Illustrate performance in a research | -Homework  -Encourage students to collect information through university provided Wi-Fi and facilities  -Demonstration | -Homework assignments  -Evaluating the proficiency in communicating the results |
| … | Demonstrate scientific methodology in solving the research problems | -Demonstration  -Homework | -Homework and demonstration assignments |

## 2. Assessment Tasks for Students

| **#** | **Assessment task\*** | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| **1** | Med-term exam I | Week 6 | 20% |
| **2** | End-term exam II | Week 12 | 20% |
| **3** | Final exam | Week 15 | 60% |
| **4** |  |  |  |
| **5** |  |  |  |
| **6** |  |  |  |
| **7** |  |  |  |
| **8** |  |  |  |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

|  |
| --- |
| **Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:** |
| Office hours (6 per week for all students)  Help session in lectures. |

# F. Learning Resources and Facilities

## 1. Learning Resources

|  |  |
| --- | --- |
| **Required Textbooks** | - G.D. Christian, “Analytical Chemistry”, 6th Ed., John Wiley & Sons, 2004.  - Skoog, West and Holler, “Fundamentals of Analytical Chemistry”, 5th Ed., Saunders College Publishing, 1988.  - Skoog, Holler and Nieman, “Principles of Instrumental Analysis”, Saunders College Publishing, 1998. |
| **Essential Reference Materials** |  |
| **Electronic Materials** |  |
| **Other Learning Materials** |  |

## 2. Educational and research Facilities and Equipment Required

| **Item** | **Resources** |
| --- | --- |
| **Accommodation**  (Classrooms, laboratories, demonstration rooms/labs, etc.) | Classroom with 25 seats. |
| **Technology Resources**  (AV, data show, Smart Board, software, etc.) |  |
| **Other Resources**  (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) |  |

# G. Course Quality Evaluation

| **Evaluation**  **Areas/Issues** | **Evaluators** | **Evaluation Methods** |
| --- | --- | --- |
| **1- Course evaluation by students every semester.** | * Students   Peer to peer evaluation from another colleague | Semester questionnaires |
| **2- Peer to peer evaluation from another colleague.** | Another faculty group. | - Discussion with another faculty group. |
| **3. Processes for Improvement of Teaching** | experts on teaching methodologies. | - I took many workshops presented with experts on teaching methodologies.  Monitoring of available materials relevant to the course on the internet. |
| 4. Processes for Verifying Standards of Student Achievement (e.g. 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) | - Staff 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.  - Using learning management system (LMS) to evaluate the % of matching in student papers. |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. | - Lecturer | - Periodical revision of course material and making appropriate changes and updates. |
|  |  |  |
|  |  |  |

**Evaluation Areas/Issues** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

# H. Specification Approval Data

|  |  |
| --- | --- |
| **Council / Committee** |  |
| **Reference No.** |  |
| **Date** | **2019** |