**COURSE SPECIFICATION**

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| This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification. |

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| College of Engineering  University of Baghdad | 1. Teaching Institution |
| Chemical engineering department | 2. University Department/Centre |
| Analytical chemistry CH.123 | 3. Course title/code |
| Chemical engineering program | 4. Programme(s) to which it contributes |
| Annual System ; There is only one  mode of delivery, which is a “Day  Program”. The students are full time  students, and on campus. They attend  full day program in face-to-face  mode. The academic year is  composed of about 30-week regular  subjects. | 5. Modes of Attendance offered |
| Year/ 2017-2018 | 6. Semester/Year |
| 150 hrs. / 5 hrs. per week | 7. Number of hours tuition (total) |
| 11-10-2017 | 8. Date of production/revision of this specification |
| 9. Aims of the Course | |
| Those who will take this course will have extensive training in the subjects that deal with chemical analysis, like calculations based on the weight relations of chemical formulas and equations, begin our study of quantitative analysis with special emphasis on analytical applications ( molarity , normality, pH of solution, Equilibrium constants) and using of some measuring devises, UV Spectrometry , Atomic Spectrometry , Gas Chromatography. This will give the students background and strong basic to higher level courses involving dealing with different solutions specifically during dealing with solutions in laboratory. | |
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| 10· Learning Outcomes, Teaching ,Learning and Assessment Methode |
| 1. Knowledge and Understanding   A1. Introduce basic definitions and introductory concepts of analytical chemistry.  A2. Show the different methods to prepare solutions with different concentrations and PH.  A3. Explains the methods to control the precipitation process .  A4. Show the methods for the quantitative calculations of oxidation reduction reactions.  A5. Explains how different quantitative measurements equipments works for the calculations of concentrations, such as atomic absorption spectrophotometry , UV spectrometer, gas chromatography ,.. etc .  A6 . Provide a background to higher level courses involving dealing with different solutions.  A7. Provide a strong quantitative and analytical understanding to the students in order to be able to deal with different solution concentrations and its preparation in chemical industry |
| B. Subject-specific skills  B1. Solve chemical reaction examples using numerical methods.  B2. Boding the class work with the laboratory work. |
| Teaching and Learning Methods |
| 1. Lectures.  2. Tutorials.  3. Homework and Assignments.  4. Lab. Experiments.  5. Tests and Exams.  6. In-Class Questions and Discussions.  7. Connection between Theory and Application.  8. In- and Out-Class oral conservations.  9. Reports, Presentations, and Posters. |
| Assessment methods |
| 1. Examinations, Tests, and Quizzes.  2. Extracurricular Activities.  3. Student Engagement during Lectures. |
| C. Thinking Skills  C1. Developing critical and creative thinking skills related to analytical chemistry.  C2. Using mathematical models.  C3. Analysis assumptions. |

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| D. General and Transferable Skills (other skills relevant to employability and personal development)  D1. Communitiy effectivity.  D2. Work individually and in group in international and multidicplinary teams.  D3. Understanding impact of engineering solutions in an environmental and social context. |

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| 11. Course Structure | | | | | |
| Assessment Method | Teaching  Method | Unit/Module or Topic Title | ILOs | Hours | Week |
| 1 – 3 (art. 10) | 1-9 (art.10) | Introduction to analytical Chem. | A1,B1,B2 | 2 the.  3 exp. | 1 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Stoichiometric calculations | A1,B1,B2 | 2 the.  3 exp. | 2 |
| 1 – 3 (art. 10) | 1-9 (art.10) | chemical coefficient | A1B1,B2 | 2 the.  3 exp. | 3 |
| 1 – 3 (art. 10) | 1-9 (art.10) | molarity | A1B1,B2 | 2 the.  5 exp. | 4 |
| 1 – 3 (art. 10) | 1-9 (art.10) | normality | A1,B1,B2 | 2 the.  5 exp. | 5 |
| 1 – 3 (art. 10) | 1-9 (art.10) | titration | A1,B1,B2 | 2 the.  5 exp. | 6 |
| 1 – 3 (art. 10) | 1-9 (art.10) | titration | A1,B1,B2 | 2 the.  5exp. | 7 |
| 1 – 3 (art. 10) | 1-9 (art.10) | density | A1,B1,B2 | 2 the.  5 exp. | 8 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Equilibrium in the acids and bases | A1,A2,B1,B2 | 2 the.  5 exp. | 9 |
| 1 – 3 (art. 10) | 1-9 (art.10) | pH | A2,B1,B2 | 2 the.  5 exp. | 10 |
| 1 – 3 (art. 10) | 1-9 (art.10) | pH | A2,B1,B2 | 2 the.  5 exp. | 11 |
| 1 – 3 (art. 10) | 1-9 (art.10) | graphs of titration | A2,B1,B2 | 2 the.  5 exp. | 12 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Indicators of bases and acids | A2,B2,B1 | 2 the.  5 exp. | 13 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Equilibrium in precipitation | A3,B1,B2 | 2 the.  5 exp. | 14 |
| 1 – 3 (art. 10) | 1-9 (art.10) | solubility | A1,A3,B1,B2 | 2 the.  5 exp. | 15 |
| 1 – 3 (art. 10) | 1-9 (art.10) | partial precipitation | A1,A2,A3,B1,B2 | 2 the.  5 exp. | 16 |
| 1 – 3 (art. 10) | 1-9 (art.10) | partial precipitation | A1,A2,A3,B1,B2 | 2 the.  5 exp. | 17 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Analysis using oxidation and reduction | A4,A1,B1,B2 | 2 the.  5 exp. | 18 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Analysis using oxidation and reduction | A4,A1,B1,B2 | 2 the.  5 exp | 19 |
| 1 – 3 (art. 10) | 1-9 (art.10) | electromotive force | A4,A1,B1 | 2 the.  5 exp. | 20 |
| 1 – 3 (art. 10) | 1-9 (art.10) | use of the half cell potentials | A4,A1,B1 | 2 the.  5 exp. | 21 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Nernest eq. | A4,A1,A2,B1 | 2 the.  5 exp. | 22 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Nernest eq. | A4,A1,A2,B1 | 2 the.  5 exp. | 23 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Measure of concentration by potential of the cell | A1,A4,A2,B1 | 2 the.  5 exp. | 24 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Selected of measuring, UV Spectrometry. | A5,A1,A2,B1 | 2 the.  5 exp. | 25 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Gas Chromatography | A5,B1 | 2 the.  5 exp. | 26 |
| 1 – 3 (art. 10) | 1-9 (art.10) | Atomic Spectrometry | A5,B1 | 2 the.  5 exp. | 27 |

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| 13. Admissions | |
| CH 123 | Pre-requisites |
|  | Minimum number of students |
| 55 | Maximum number of students |

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| 12. Infrastructure | |
| Text book,  "Quantitative analysis ", by Pierce Haeinsch , Sawyer 4th edition ,1958  Reference book,  Analytical chemistry by Gary D. Christian | Required reading:  · CORE TEXTS  · COURSE MATERIALS  · OTHER |
| Laboratory experiments in the ( Analytical chemistry Lab ) of the department.  Available websites related to the subject.  Extracurricular activitie | Special requirements (include for example workshops, periodicals, IT software, websites) |
| scientific visits | Community-based facilities  (include for example, guest  Lectures , internship , field studies) |