**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 CHED)) | 2. University Department/Centre |
| Engineering Analysis/ CHE 331  This course concerns with a method of analysis and solution of differential equation. The topics covered are: 1st order differential equations, 2nd order differential equations, Frobineous method, Higher order differential equations, Simultaneous differential equations, Partial differential equations, Laplace transform, Mathematical modelling, Finite differences (application on chemical engineering systems) with multiple steps. The course is taught through 4 hrs per week, 3 theories, and 1 tutorial. | 3. Course title/code |
| Chemical Engineering Department (CHED) | 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 30-week regular subjects. | 5. Modes of Attendance offered |
| 1st & 2nd Semesters/Academic Year 2017 -2018. | 6. Semester/Year |
| 120 hrs. / 4 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 | |
| The aims of the course are:   1. To develop and understanding the methods to solve differential equations. 2. To build students capacity in modeling and solving chemical engineering problems. 3. To present the basic transport equations and to apply these equations practically. 4. To build the capacity in the design of equipment. | |

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| 10· Learning Outcomes, Teaching ,Learning and Assessment Methode |
| 1. Knowledge and Understanding   A1. Know how to solve the different types of 1st order differential equations using different types of methods.  A2. Know how to solve the different types of 2nd order differential equations using different types of methods.  A3. Know how to use different techniques to solve partial differential equations.  A4. Build students capacity in modeling and solving chemical engineering problems. |
| B. Subject-specific skills  B1. To build students capacity in modeling and solving chemical engineering problems.  B2. Be familiar with the momentum, heat and mass transport equations and able to use the relevant equations in solving the problems |
| C. Thinking Skills  C1. Build students capacity in modeling and solving chemical engineering problems.  C2. Be familiar with the momentum, heat and mass transport equations and able to use the relevant equations in solving the problems |
| D. General and Transferable Skills (other skills relevant to employability and personal development) .  D1.Work in groups and function on multi-disciplinary teams.  D2. Understand professional, social and ethical responsibilities.  D3. Communicate effectively. |
| Teaching and Learning Methods |
| 1. Lectures  2. Tutorials  3. Homework and assignments  4. Tests and Exams  5. In-Class questions and discussions  6. Connection between theory and application  7. Seminars.  8. In- and Out-Class oral conservations. |
| Assessment methods |
| 1. Examinations, Tests, and Quizzes.  2. Extracurricular activities and homework.  3. Student engagement during lectures. |

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| 11. Course Structure | | | | | |
| Assessment Method | Teaching  Method | Unit/Module or Topic Title | ILOs | Hours | Week |
| 3 | 1 | Introduction to Engineering Analysis | a, f, g, h, i, j, k | 4  3 theo.  1 tut. | 1 |
| 1-3 | 1-6 | 1st order differential equations | a, f, g, h, i, j, k | 4  3 theo.  1 tut. | 2 |
| 1-3 | 1-9 | Using different methods to solve 1st Order D.E. | a, f, g, h, i, j, k | 4  3 theo.  1 tut. | 3 |
| 1-3 | 1-9 | Using different methods to solve 1st Order D.E. | a, f, g, h, i, j, k | 4  3 theo.  1 tut. | 4 |
| 1-3 | 1-9 | 2nd Order differential equations | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 5 |
| 1-3 | 1-9 | 2nd Order Non-linear D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 6 |
| 1-3 | 1-9 | 2nd Order Non-linear D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 7 |
| 1-3 | 1-9 | 2nd order linear D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 8 |
| 1-3 | 1-9 | Using different methods to solve 2nd order linear D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 9 |
| 1-3 | 1-9 | Using different methods to solve 2nd order linear D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 10 |
| 1-3 | 1-9 | Solving 2nd order linear D.E. using Frobenius | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 11 |
| 1-3 | 1-9 | Solving 2nd order linear D.E. using Frobenius | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 12 |
| 1-3 | 1-9 | Higher order D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 13 |
| 1-3 | 1-9 | Simultaneous D.E. | b, f, g, h, i, j, k | 4  3 theo.  1 tut. | 14 |
| 1-3 | 1-9 | Introduction to Partial Differential Equations | c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 15 |
| 1-3 | 1-9 | Partial Differential Equations | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 16 |
| 1-3 | 1-9 | Solving P.D.E using separation of variables | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 17 |
| 1-3 | 1-9 | Solving P.D.E using changing of variables | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 18 |
| 1-3 | 1-9 | Introduction to Laplace Transformation | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 19 |
| 1-3 | 1-9 | Solving D.E using L.T. | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 20 |
| 1-3 | 1-9 | Solving D.E using L.T. | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 21 |
| 1-3 | 1-9 | Solving D.E using L.T. | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 22 |
| 1-3 | 1-9 | Partial differential equations by L.T. | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 23 |
| 1-3 | 1-9 | Partial differential equations by L.T. | a, b, c, f, g, h, i, j, k | 4  3 theo.  1 tut. | 24 |
| 1-3 | 1-9 | Introduction to mathematical modeling | d, e, f, g, h, i, j, k | 4  3 theo.  1 tut. | 25 |
| 1-3 | 1-9 | Mathematical Modeling | d, e, f, g, h, i, j, k | 4  3 theo.  1 tut. | 26 |
| 1-3 | 1-9 | Mathematical Modeling | a, b, c, d, e, f, g, h, i, j, k | 4  3 theo.  1 tut. | 27 |
| 1-3 | 1-9 | Mathematical Modeling | a, b, c, d, e, f, g, h, i, j, k | 4  3 theo.  1 tut. | 28 |
| 1-3 | 1-9 | Finite Difference | a, b, d, e, f, g, h, i, j, k | 4  3 theo.  1 tut. | 29 |
| 1-3 | 1-9 | Finite Difference | a, b, d, e, f, g, h, i, j, k | 4  3 theo.  1 tut. | 30 |

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| 12. Infrastructure | |
| 1. Jensen, V.G., Jeffery, G.V. - Mathematical Methods in Chemical Engineering.  2. Arvind V. and Massimo M. - Mathematical Methods in Chemical Engineering by  References:  1. Rice, R.G., Do, D.D. - Applied Mathematics and Modeling for Chemical Engineers.  2. Mickley, H.S., Sherwood, T.K., Reed, C.E. – Applied Mathematics in Chemical Engineering  ***Others:***  1.Notebook prepared by the instructor of the course  2.Collection of sheets of solved and unsolved problems and Exams sheets | Required reading:  · CORE TEXTS  · COURSE MATERIALS  · OTHER |
| 1. Available websites related to the subject  2. Excel or similar software for the solution of lengthy problems. | Special requirements (include for example workshops, periodicals, IT software, websites) |
| 1. Field and scientific visits  2. Extra lectures by foreign guest lecturers | Community-based facilities  (include for example, guest  Lectures , internship , field studies) |

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| 13. Admissions | |
| CHE121, CHE221, CHE241, CHE342, CHE 343, and CHE345. | Pre-requisites |
| - | Minimum number of students |
| 70 | Maximum number of students |

***Course Instructors***

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