**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 programmer specification.  |

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| University of Baghdad | 1. Teaching Institution |
| College of Engineering / Energy Engineering | 2. University Department/Centre |
| Engineering Analysis  | 3. Course title/code |
| BSc.  | 4. Programmer (s) to which it contributes |
| weekly | 5. Modes of Attendance offered |
| year | 6. Semester/Year |
| 90 hour | 7. Number of hours tuition (total) |
| 1/12/2022 | 8. Date of production/revision of this specification |
| 9. Aims of the Course |
| 1- Identify the types of normal differential equations. |
| 2- Teaching students ways and methods to solve linear ordinary differential equations. |
| 3- Introduce students to the power series and use it to dissolve the ordinary differential equation of the second degree. |
| 4- The student recognizes the Bessel’s equation and Legendre’s equation and the way to solve them. |
| 5- To get to know and use Fourier series representation of periodic functions. |
| 6- To recognizes the Laplace transformation and various uses in solving differential equations. |
| 7- To learn the partial differential equations and solved by the Laplace transform. |
| 8- To learn the surface integration and the integration by residue. |
| 9- To learn about some special functions like Gamma function.  |

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| 10· Learning Outcomes, Teaching ,Learning and Assessment Methods |
| 1. Knowledge and Understanding

A1. To identify the different ranks of ordinary linear differential and partial equations and how to solve it.A2 Identify the power series and used it to solve differential equations.A3. how to use the Laplace transformation in solving ordinary and partial differential equations.A4. knowledge and understanding of surface integration and integration by the residual method.A5. know and understand some of the special functions such as the Gamma function. |
|  B. Subject-specific skillsB1. Teach the student how to deal with the engineering equations and how to solve it.B2. Use different methods in solving equations.B3. How to deal with the linear integration and surfactants. |
|  Teaching and Learning Methods |
| The method of lecturing.Team Project.The method of discussion and weekly assignments. |
|  Assessment methods  |
| Daily and monthly tests. |
| C. Thinking Skills C1. Teach the student how to deal with the engineering equations and how to solve it.C2. Use different methods in solving equations.C3. How to deal with the linear integration and surfactants. |
|  Teaching and Learning Methods  |
| The lecture ,discussion, solve problems. |
|  Assessment methods |
| Daily and monthly tests. |

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| D. General and Transferable Skills (other skills relevant to employability and personal development) D1. Formation of differential equations. D2. Solving engineering problems.D3. Implementation of several ways to resolve and partial differential equations |

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| 11. Course Structure |
| Assessment Method | TeachingMethod | Unit/Module or Topic Title | ILOs | Hours | Week |
| A theoretical tests | The lecture and discussion | First order ordinary differential equations | An introduction of first order ordinary diff. equations | 3 | 1 |
| A theoretical tests | The lecture and discussion | First order ordinary differential equations  | Solution of first order ODE | 3 | 2 |
| A theoretical tests | The lecture and discussion | Homogenous second order ODE | Solution of second order ODE | 3 | 3 |
| A theoretical tests | The lecture and discussion | Non Homogenous second order ODE | Solution of the equations by undetermined coef. Meth. | 3 | 4 |
| A theoretical tests | The lecture and discussion | Non Homogenous second order ODE | Solution of the equations by D operator meth. | 3 | 5 |
| A theoretical tests | The lecture and discussion | Non Homogenous second order ODE | Solution of the equations by variation of parameters meth. | 3 | 6 |
| A theoretical tests | The lecture and discussion | Euler’s equation | Solution of the Euler’s equation | 3 | 7 |
| A theoretical tests | The lecture and discussion | Non Homogenous second order ODE | Solution of simultaneous second ODE | 3 | 8 |
| A theoretical tests | The lecture and discussion | Higher order ODE | Solution of homogenous third and fourth order ODE | 3 | 9 |
| A theoretical tests | The lecture and discussion | Higher order ODE | Solution of non homogenous third order ODE | 3 | 10 |
| A theoretical tests | The lecture and discussion | Power series  | Solution of second order ODE | 3 | 11 |
| A theoretical tests | The lecture and discussion | Bessel’s and Legendre’s equation | Solution of Bessel’s and Legendre’s equation  | 33 | 12 |
| A theoretical tests | The lecture and discussion | Fourier series | Representation of periodic fun. By Fourier series  | 3 | 13 |
| A theoretical tests | The lecture and discussion | Fourier series | Representation of periodic fun. By Fourier series  | 3 | 14 |
| A theoretical tests | The lecture and discussion | Fourier series | Simplification of periodic fun.  | 3 | 15 |
| A theoretical tests | The lecture and discussion | Laplace transformation | An introduction of Laplace trans. And Laplace trans. For basic fun. | 3 | 16 |
| A theoretical tests | The lecture and discussion | Laplace transformation | Theory of Laplace trans. | 3 | 17 |
| A theoretical tests | The lecture and discussion | Laplace transformation | Examples of Laplace trans. | 3 | 18 |
| A theoretical tests | The lecture and discussion | Laplace transformation | Laplace inverse  | 3 | 19 |
| A theoretical tests | The lecture and discussion | Laplace transformation | Examples of Laplace inverse. | 3 | 20 |
| A theoretical tests | The lecture and discussion | Laplace transformation | Solution of second order ODE by Laplace trans. | 3 | 21 |
| A theoretical tests | The lecture and discussion | Laplace transformation | Examples | 3 | 22 |
| A theoretical tests | The lecture and discussion | Partial differential eq. | Solution of homogenous Partial differential Eq. | 3 | 23 |
| A theoretical tests | The lecture and discussion | Partial differential eq. | Solution of non homogenous Partial differential Eq. | 3 | 24 |
| A theoretical tests | The lecture and discussion | Partial differential eq. | Initial and boundary cond. problems | 3 | 25 |
| A theoretical tests | The lecture and discussion | Partial differential eq. | Solution of Partial diff. eq. by Laplace trans. | 3 | 26 |
| A theoretical tests | The lecture and discussion | Partial differential eq. | Solution of Partial diff. eq. by Laplace trans. | 3 | 27 |
| A theoretical tests | The lecture and discussion | Complex Variable  | Functions coordinate transformation from Cartesian to polar  | 3 | 28 |
| A theoretical tests | The lecture and discussion | Complex Variable | Harmonic function | 3 | 29 |
| A theoretical tests | The lecture and discussion | Complex integration | Surface integration and integration by residue  | 3 | 30 |

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| 12. Infrastructure |
| Advance Engineering Mathematicsothers references from an internet. | Required reading:· CORE TEXTS· COURSE MATERIALS· OTHER |
|  | Special requirements (include for example workshops, periodicals, IT software, websites) |
|  | Community-based facilities(include for example, guestLectures , internship , field studies) |

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| 13. Admissions |
|  | Pre-requisites |
| 20 | Minimum number of students |
| 60 | Maximum number of students |