**TEMPLATE FOR COURSE SPECIFICATION**

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

Course Instructor: Dr. Ziad Tark Abd Ali

**COURSE SPECIFICATION**

**Full knowledge of differential equations: classification, solution methods, and modeling**

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| 1. Teaching Institution | University of Baghdad/ College of Engineering |
| 2. University Department/Centre | Environmental Engineering Department |
| 3. Course title/code | Hazardous Waste |
| 4. Modes of Attendance offered | 2 days per week electronic |
| 5. Semester/Year | Year |
| 6. Number of hours tuition (total) | 90 h |
| 7. Date of production/revision of this  specification | 2019 |
| 8. Aims of the Course | |
| 1. Classify the differential equations according to type, order, degree, and linearity | |
| 1. Categorize 1st and/or 2nd order ordinary differential equations according to methods of solution. Practice various methods of solutions. | |
| 3- Recognize partial differential equations and learn methods of solution. | |
| 4- Formulate (MODELLING) and solve 1st and/or 2nd order ordinary differential equations related to engineering applications with examples from fluid mechanics, heat and/or mass transfer in addition to microbiology and chemical kinetics. | |
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9· Learning Outcomes, Teaching, Learning and Assessment Method

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| A- Cognitive goals.   |  | | --- | | A1. Training students to be able to classify differential equations and solve them in correct ways | | A2. Attract and welcome undergraduate students to our Bachelor of Science program in Environmental Engineering, and to graduate B.S. students who are innovative problem solvers, who become leaders in their organizations, and who possess the knowledge and skills required for a wide range of careers and career changes. | |
| B. The skills goals special to the course.   |  | | --- | | B1. Employing methods of solving differential equations to convert some environmental phenomena into mathematical relationships through which we can predict what will happen in the future, and this is called "Modeling" | | B2. Concentrating on scientific research and its leading role in helping to serve the society and solving its problems through conducting application researches | |
| Teaching and Learning Methods |
| More description of case studies and applications |
| Assessment methods |
| Homework related to problem solving |
| C. Affective and value goals   |  | | --- | | C1. Development of students' mental skills | | C2. Training students to link mathematics with environmental concepts  C3.Prepare students for successful careers in environmental engineering |   . |
| Teaching and Learning Methods |
| Intensive studies of regulations |
| Assessment methods |
| Case studies |

D. General and rehabilitative transferred skills (other skills relevant to employability and personal development)

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| D1. Become more effective, independent and confident self-directed learners |
| D2. Improve their general skills for study and career management  D3. Articulate personal goals and evaluate progress towards their achievement  D4.An ability to identify, formulate, and solve engineering problems |

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| 10. Course Structure | | | | | |
| Week | Hours | ILOs | Unit/Module or  Topic Title | Teaching  Method | Assessment  Method |
| 1 | 3 |  | Introduction to differential equations | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 2 | 3 |  | Classification of differential equations. | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 3 | 3 |  | Solution approach to ordinary differential equations. | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 4 | 3 |  | Categorization of first order differential equations. | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 5 | 3 |  | Solution methods of a first order differential equations. | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 6 | 3 |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 7 | 3 |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 8 | 3 |  | Categorization of second order differential equations. | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 9 | 3 |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 10 | 3 |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 11 | 3 |  | Simultaneous differential equations | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 12 | 3 |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 13 | 3 |  | High order differential equations | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 14 | 3 |  | Inverse D-operator method | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 15 | 3 |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 16 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 17 |  |  | Laplace transformations | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 18 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 19 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 20 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 21 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 22 |  |  | partial differential equations and learn methods of solution | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 23 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 24 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 25 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 26 |  |  | Formulation and engineering applications of ordinary first and second order differential equations. | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 27 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 28 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 29 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 30 |  |  | = | Electronic | Questions during the lectures ,quiz, exam, present in the class |

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| 11. Infrastructure | |
| 1. Books Required reading: | 1. Differential Equations; 3rd. Ed.; Goode & Annan; Pearson, 2007. 2. Advanced Engineering Mathematics; 5th Ed.; Wylie & Barrett ; McGraw-Hill , 1982 |
| 2. Main references (sources) | Elementary Differential equations ; 6th edition ; by C.Henry Edwards & David E.Perrey ; Pearson-Prentice Hall, 2008 |
| A- Recommended books and references (scientific journals, reports…). |  |
| B-Electronic references, Internet  sites… |  |

12. The development of the curriculum plan

The development could concentrate on more applications and mathematical modeling.