**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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| Baghdad University-College of Engineering | 1. Teaching Institution |
| Dept. of Environmental Engineering | 2. University Department/Centre |
| Industrial Processes for Wastewater Treatment | 3. Course title/code |
| Fourth year students | 4. Program (s) to which it contributes |
| Classrooms attendance | 5. Modes of Attendance offered |
| Annual course | 6. Semester/Year |
| 3 hours/week \* 32 weeks = 96 h | 7. Number of hours tuition (total) |
|  | 8. Date of production/revision of this specification  |
| 9. Aims of the Course |
| 1. To better understanding fundamentals of the characterization, minimization, and treatment selection of industrial wastewater treatment systems. |
| 2. To help students develop their ability to apply basic understandings of physical, chemical, and biological technologies to the successful design and operation of industrial water and wastewater treatment plants. |
| 3. Students fulfill understanding of the knowledge in wastewater treatment systems and enhancing the principles of treatment plants design aspects. |
| 4. This course will help preparing the students for skills that are used to control the fate of wastewater generated by industry with a worldwide focus on water quality and management. |
| 5. Understand principles of pollution prevention and control including Reduce, Reuse, and Recycle. |
| 6. Get insight in wastewater generation within number of selected industries, and identify different technologies for the treatment of industrial effluents. |

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

A1. Understand the measures of industrial water and wastewater quality and the reasoning behind water quality standards, and sampling methods.A2. Understand the physical, chemical and biological processes behind industrial water and wastewater treatment.A3. Learn the engineering approaches to treatment technologies including the design of key unit operations.A4. Understand the effectiveness and limitations of different treatment techniques in relation to the quality of the incoming water and wastewater.A5. Select or construct appropriate treatment schemes to remove certain pollutants present in water or wastewater.A6. Understand selected contemporary industrial water and wastewater issues such as wastewater reuse and emerging contaminants.  |
|  B. Subject-specific skillsB1.B2. B3. |
|  Teaching and Learning Methods |
| Lectures, case studies applications, homework |
|  Assessment methods  |
| 1. Lecture recap and in-class activities: each class will commence with a recap of the previous lecture, questions will be asked and the responses will be used to evaluate the students’ understanding of the topics covered. In addition, short activities will be given throughout the semester. Immediately following these exercises answers will be reviewed and discussed.
2. Lecture recap and in-class activities: each class will commence with a recap of the previous lecture, questions will be asked and the responses will be used to evaluate the students’ understanding of the topics covered. In addition, short activities will be given throughout the semester. Immediately following these exercises answers will be reviewed and discussed.
3. Lecture recap and in-class activities: each class will commence with a recap of the previous lecture, questions will be asked and the responses will be used to evaluate the students’ understanding of the topics covered. In addition, short activities will be given throughout the semester. Immediately following these exercises answers will be reviewed and discussed.
4. Reviews preceding exams – a question-answer in-class review session will precede each examination. The question-answer session will allow for

 Assessment of the student’s comprehension of topics covered. Class discussion of the material will be encouraged and material will be recapped briefly.1. Mid-semester examinations

 (Theoretical and practical) each exam will be reviewed in class, with class discussion. |
| C. Thinking Skills C1.C2.C3.C4.  |
|  Teaching and Learning Methods  |
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|  Assessment methods |
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| D. General and Transferable Skills (other skills relevant to employability and personal development) D1.D2.D3.D4.  |

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| 11. Course Structure |
| Assessment Method | TeachingMethod | Unit/Module or Topic Title | ILOs | Hours | Week |
|  | Theoretical + applications | Definition of industrial water &wastewater  |  | 3 | 1 |
|  | Theoretical + applications | Characteristics of industrial wastewaters |  | 3 | 2 |
|  | Theoretical + applications | Characteristics of industrial wastewaters |  | 3 | 3 |
|  | Theoretical + applications | Classification of treatment methods |  | 3 | 4 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 5 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 6 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 7 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 8 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 9 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 10 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 11 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 12 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 13 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 14 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 15 |
|  | Theoretical +applications | Definition of industrial water &wastewater  |  | 3 | 16 |
|  | Theoretical + applications | Characteristics of industrial wastewaters |  | 3 | 17 |
|  | Theoretical + applications | Characteristics of industrial wastewaters |  | 3 | 18 |
|  | Theoretical + applications | Classification of treatment methods |  | 3 | 19 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 20 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 21 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 22 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 23 |
|  | Theoretical + applications | Physical treatment processes |  | 3 | 24 |
|  | Theoretical + applications | Biological treatment processes |  | 3 | 25 |
|  | Theoretical + applications | Biological treatment processes |  | 3 | 26 |
|  | Theoretical + applications | Biological treatment processes |  | 3 | 27 |
|  | Theoretical + applications | Biological treatment processes |  | 3 | 28 |
|  | Theoretical + applications | Biological treatment processes |  | 3 | 29 |
|  | Theoretical + applications | Biological treatment processes |  | 3 | 30 |

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| 12. Infrastructure |
| References1 .Wastewater Treatment for Pollution Control and Reuse, Tata McGraw- Hill Pub., Co.,  Authors: S.J. Arceivala and S.R. Asolekar 2.Industrial Wastewater Treatment, Prentice-Hall of India Private., Lt.,  Author: A.D. Patwardhan3.Water and Wastewater Technology, Pearson Education InternationalAuthor: M.J. Hammer, JR | 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 |
|  | Minimum number of students |
|  | Maximum number of students |