**TEMPLATE FOR COURSE SPECIFICATION**

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

Course Instructor : Prof. Dr. Shahlaa Esmil Ebrahim

**COURSE SPECIFICATION**

**Full knowledge of hazardous wastes, regulations, properties of hazardous wastes, and some remediation methods.**

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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 | Semester |
| 6. Number of hours tuition (total) | 45 h |
| 7. Date of production/revision of thisspecification | 2020-2021 |
| 8. Aims of the Course |
| 1. Understanding hazardous waste, industrial waste, etc.
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| 1. Understanding the hazardous waste accidents.
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|  3- Knowledge of legal, institutional and financial aspects of management of hazardous wastes |
|  4- Become aware of Environment and health impacts hazardous waste mismanagement |
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9· Learning Outcomes, Teaching ,Learning and Assessment Method

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| A- Cognitive goals .

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| A1. After completion of the course students should be able to characterization of hazardous waste |
| A2. analysis of hazardous waste constituents including QA/QC issues. |

A3. 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.

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| B1.Understand health and environmental issues related to hazardous waste management |
| B2. apply steps in hazardous waste management-waste reduction at source, collection techniques, materials and resource recovery/recycling, transport. |

B3.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

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| C1. Optimization of solid waste transport, treatment and disposal techniques |
| C2. Economics of the onsite vs. offsite waste management optionsC3.Prepare students for successful careers in environmental engineering |

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| 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 managementD3. Articulate personal goals and evaluate progress towards their achievementD4.An ability to identify, formulate, and solve engineering problems |

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| 10. Course Structure |
| Week | Hours | ILOs | Unit/Module orTopic Title | TeachingMethod | AssessmentMethod |
| 1 | 3 | Definition of hazardous waste | General definition of hazardous waste, sources |  Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 2 | 3 | Disposal of hazardous waste | Past disposal of HW, Pre regulatory disposal of hazardous waste,  | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 3 | 3 | Environmental legislation | hazardous waste environmental legislation and disposal regulations, RCRA, HSWA, SARA | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 4 | 3 | Hazardous management | Hazardous management, assessment and control, NCP, Risk | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 5 | 3 | Cradle to grave of hazardous waste | Source – pathway-receptor analysis | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 6 | 3 | Nomenclature | Hazardous waste nomenclature, organic, inorganic | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 7 | 3 | Types of Hazardous wastes | Organic , Inorganic, and radioactive hazardous waste | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 8 | 3 | Properties of HW | Concentration of HW in water, air, soil , specific activity | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 9 | 3 | Properties of HW | Water solubility of weak acids and bases | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 10 | 3 | Properties of HW | Density and specific gravity, Light and dense nonaqueous phase liquid | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 11 | 3 | Properties of HW | Flammability limits | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 12 | 3 | Properties of HW | Flash point andignition temperature | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 13 | 3 | Methods of treatment | Adsorption, ion exchange | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 14 | 3 | Methods of treatment | Equilibrium isotherm models | Electronic | Questions during the lectures ,quiz, exam, present in the class |
| 15 | 3 | Transportaion of HW | Labels and placards | Electronic | Questions during the lectures ,quiz, exam, present in the class |

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| 11. Infrastructure |
| 1. Books Required reading: | 1-Hazardous materials spills handbook, Gary F. Bennett, McGraw Hills Book Comp. (1982).2-Environmental treatment technology for hazardous and medical wastes-remedial scope and efficacy by Dutta3-2014 HAZARDOUS WASTE REPORT INSTRUCTIONS AND FORMS, Louisiana Department of Environmental Quality, 2014.4- 2016 HAZARDOUS WASTE REPORT, Louisiana Department of Environmental Quality, 2016.  |
| 2. Main references (sources) | Hazardous wastes, sources, pathways, receptors, by Richard J. Watts (1997) |
| A- Recommended books and references (scientific journals, reports…). | Journals 1. International Journal of Environment and Waste Management 2. Waste Management |
| B-Electronic references, Internetsites… | <https://www.epa.gov/hw/household-hazardous-waste-hhw><https://nepis.epa.gov/Exe/ZyNET.exe/10001XBX.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File>=D%3A%5Czyfiles%5CIndex%20Data%5C95thru99%5CTxt%5C00000000%5C10001XBX.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL# |

12. The development of the curriculum plan

The development could concentrate on more applications and mathematical modeling through taking 2 courses instead of one.