**TEMPLATE FOR COURSE SPECIFICATION**

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

Course Instructor : Instructor Hayder Muhssin Rashid

**COURSE SPECIFICATION**

**Fully understanding the relationship between theory and applied control dynamics in the fourth stage of the Environmental Engineering as well as constructing MM to investigate the forcing functions/ response**

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| 1. Teaching Institution | University of Baghdad/ College of Engineering |
| 2. University Department/Centre | Environmental Engineering Department |
| 3. Course title/code | Control dynamics in Environmental Eng. |
| 4. Modes of Attendance offered | Electronic lectures are delivered twice a week |
| 5. Semester/Year | Annual |
| 6. Number of hours tuition (total) | 75 hours (3 hours a week) |
| 7. Date of production/revision of thisspecification |  |
| 8. Aims of the Course |
| 1. Appreciate significance of control for dynamic systems.
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| 1. Understand the dynamic characteristics, transfer functions, forcing functions and responses of systems, comprising various elements, mathematically and physically
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|  3- Differentiate between dynamics of systems in an open- loop or a closed-loop situation. |
|  4- Understand the basics of feedback control loops, their block diagram algebra, responses as regulatory/servo loops, controller’s modes of action, final control elements and stability differentiation. |
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9· Learning Outcomes, Teaching ,Learning and Assessment Method

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| A- Cognitive goals .

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| A1. Making the student to be fully aware of how control variables being manupilated in Environmental applications. |
| A2. Making use of up-to-date criteria dealing with analog and digitals conrols. |

 A3. Using of most advanced electronic devices in controllers.  |
| B. The skills goals special to the course.

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| B1- Understanding the nature and behavior of controllers in Env. Eng applications. |
| B2. Making Laplace transforms in solving initial values problems.B3- Constructing the block diagrams for the dynamic systemsB4- Making stability investigation for the given control problems.B5- Relating the theory to applied control dynamics. |

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| Teaching and Learning Methods |
| Extensive description of case studies and applications regarding the Environmental Engineering studies, Lectures, homework and assignments tests, and exams, class oral conservations, questions and discussions, comparison between theory and applications and conducting experiments in labs. |
| Assessment methods |
| Homework related to problem solving, student participation through class session, preparation of reports, quizzes, monthly exams, student attendance, and lucrative encouragement.  |
| C. Affective and value goals

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| C1. Getting optimum values through the applications of control disturbances and transfer functions. |
| C2. Facilitate the algebraic and solving problems that might be encountered in biochemistry, organic, etc,. C3. Getting students to trouble shoot and overcome cumbersome solutions in math. |

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| Teaching and Learning Methods |
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| Teaching and Learning MethodsIntensive studies of regulations |

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| 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 | Assessment Method | TeachingMethod | Unit/Module or Topic Title | ILOs | Hours |  |
| 1 | Making questions during the lectures, quizzes, exams, and attendance in the class. | Electronic | Making an overview of the Laplace Transforms concepts | 1&2 | 3 (Theory)  |  |
| 2 | Making questions during the lectures ,quizzes, exams, and attendance in the class. |  Electronic | Constructing the MM through material and energy balances | 1 &2 | 3 (Theory) |  |
| 3 | Making questions during the lectures ,quizzes, exams, and attendance in the class. |  Electronic | Determination of the initial and final values | 1 &2 | 3 (Theory) |  |
| 4 | Making questions during the lectures ,quizzes, exams, and attendance in the class. |  Electronic | Solving the driving force/ response problems.  | 1 &2 | 3 (Theory) |  |
| 5 | Making questions during the lectures ,quizzes, exams, and attendance in the class. |  Electronic | Constructing the block diagrams  | 1 &2 | 3 (Theory) |  |
| 6 | Making questions during the lectures ,quizzes, exams, and attendance in the class. |  Electronic | Investigating the system stability using Routh and Nyquist criteria. | 1 &2 | 3 (Theory) |  |
| 7 | Making questions during the lectures ,quizzes, exams, and attendance in the class. |  Electronic and lab attendance | Determining the time constant in thermometer  | 1 &2 + lab | 3 (Theory)3 (Lab) |  |
| 8 | Making questions during the lectures, quizzes, exams, and attendance in the class. |  Electronic and lab attendance | Determining the time constant in liquid level tanks | 1 &2 + lab | 3 (Theory)3 (Lab) |  |
| 9 | Making questions during the lectures, quizzes, exams, and attendance in the class. |  Electronic and lab attendance | Determining the time constant in heating tanks | 1 &2 + lab | 3 (Theory)3 (Lab) |  |
| 10 | Making questions during the lectures, quizzes, exams, and attendance in the class. |  Electronic and lab attendance | Determining the time constant in interacting tanks | 1 &2 + lab | 3 (Theory)3 (Lab) |  |
| 11 | Making questions during the lectures, quizzes, exams, and attendance in the class. |  Electronic and lab attendance | Control Valves and identifying the open/close to air types | 1 &2 + lab | 3 (Theory)3 (Lab) |  |
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| 11. Infrastructure |
| 1. Books Required reading: |  1-Modern Control Engineering, OGATA, 4th ed., 2014.2-Feedback control system and synthesis, John D'Azzo and H. Houpis, international dition, 1965.3-Principles of control systems, S.P.Eugene and Joseph Babu, S.Chand, 14th ed., 2019. |
| 2. Main references (sources) | Process systems analysis and Control, Coughanowr, 2nd ed., McGraw-Hill, 1991.  |
| A- Recommended books and references (scientific journals, reports…). | Journals of air pollution controls and environment protection and any textbooks on control dynamics  |
| B-Electronic references, Internetsites… | <https://www.amazon.com/Modern-Control-Engineering-Katsuhiko-Ogata/dp/0136156738><https://www.amazon.com/Feedback-Synthesis-Electrical-Electronic-Engineering/dp/0070851506><https://www.amazon.com/Process-Systems-Analysis-Coughanowr-1991-08-01/dp/B01FKRFT8K> |

12. The development of the curriculum plan

The development must impose field visits for the students to the chemical plants in order to make them well acquainted on the process dynamics and how they be controlled as well as make them fully aware of the connection between the theoretical material and its applications.