**TEMPLATE FOR COURSE SPECIFICATION**

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| **Automatic Control Engineering** |

**COURSE SPECIFICATION**

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| **Course title: Automatic Control Engineering**  **(Code):MEC 402**  **Academic Year (2016 – 2017)** |

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| College of Engineering  University of Baghdad | ***1. Teaching Institution*** |
| Mechanical Engineering Department (MED) | ***2. University Department/Centre*** |
| **Automatic Control Engineering & Measurement** | ***3. Course title/code & Description*** |
| Mechanical Engineering ( ME ) | ***4. Programme(s) to which it Contributes*** |
| Mechanical Students/ fourth class | ***5. Modes of Attendance offered*** |
| yearly | ***6. Semester/Year*** |
| 90 hours | ***7. Number of hours tuition (total)*** |
| 22 September – First June | ***8. Date of production/revision of this specification*** |
| ***9. Aims of the Course*** | |
| 1. To provide a general understanding of the characteristics of dynamic systems and feedback control. 2. To teach classical methods for analyzing control system accuracy, stability and dynamic performance. 3. To teach classical control system design methods. | |

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| ***10·*** ***Learning Outcomes*** |
| At the end of the class, the student will be able to:   1. Be able to model mathematically and by simulation the dynamic systems. 2. Have a general understanding of the basic concepts of control systems. 3. Be able to apply mathematical tools as they relate to the design of control systems. 4. Be able to apply the control design techniques to real world problem. |
| ***11.*** ***Teaching and Learning Methods*** |
| 1. Lectures 2. Small group discussions 3. Tutorials 4. Practical classes 5. Assignments. |
| ***12. Assessment Methods*** |
| 1. Written examination. To assess knowledge, understanding and skills 2. Oral examination. To assess knowledge, skills and intellectual functions, and attitude. 3. Practical examination. To assess knowledge, professional skills and attitude. 4. Home Works   ***13. Grading Policy***   1. Quizzes and Home works, 30% 2. Final Course Exam, 70% 3. Total, 100% |
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| ***14. Course Structure*** | | | | | |
| Assessment Method | Teaching  Method | Unit/Module or Topic Title | LOs  ( Article 10 ) | Hours | Week |
| All | All | Introduction to control. |  | 2 | 1 |
| All | All | Representation of control components, Mechanical components. |  | 2 | 2 |
| All | All | Electrical Components, Grounded-Chair Representation. |  | 2 | 3 |
| All | All | Degrees of freedom, Analogies. |  | 2 | 4 |
| All | All | Thermal systems, Fluid System. |  | 2 | 5 |
| All | All | Representation of Control systems, Linearization of non-linear functions. |  | 2 | 6 |
| All | All | Linearization of Operating Curves, Hydraulic Systems, Pneumatic Systems, DC motors. |  | 2 | 7 |
| All | All | AC motors, Block Diagram Algebra. |  | 2 | 8 |
| All | All | Speed Control System, Generalized Feedback Control System. |  | 2 | 9 |
| All | All | Steady-State Operation, Steady-State Analysis. |  | 2 | 10 |
| All | All | Equilibrium, Proportional Control System. |  | 2 | 11 |
| All | All | Integral Control System, Proportional plus Integral Control System. |  | 2 | 12 |
| All | All | Modes of Control. |  | 2 | 13 |
| All | All | Laplace Transforms, Classical Methods. |  | 2 | 14 |
| All | All | Laplace Transformation Method, Transform Properties. |  | 2 | 15 |
| All | All | Initial Conditions, General Procedures. |  | 2 | 16 |
| All | All | Transient Response, Inverse Transformation. |  | 2 | 17 |
| All | All | Complex Conjugate Zeros, Damping Ratio and Natural Frequency. |  | 2 | 18 |
| All | All | Transient Response Specifications, General form of Transient Response. |  | 2 | 19 |
| All | All | Response to an External Disturbance, Impulse Response. |  | 2 | 20 |
| All | All | Routh’s Stability Criterion. |  | 2 | 21 |
| All | All | The Root Locus Method, Significance of root loci. |  | 2 | 22 |
| All | All | Construction of Loci, General Procedure, Loci Equations. |  | 2 | 23 |
| All | All | Frequency Response Method, Frequency Response, Logarithmic Representation. |  | 2 | 24 |
| All | All | Evaluating the Gain K, Equivalent Unity Feedback System. |  | 2 | 25 |
| All | All | Polar Plots, M and α Circles, Standards and calibration |  | 2 | 26 |
| All | All | Correlation between Transient and Frequency Response. |  | 2 | 27 |
| All | All | Determination the Gain K to yield desired Mp. |  | 2 | 28 |
| All | All | Determination the Gain Margin and Phase Margin |  | 2 | 29 |
| All | All | General Review |  | 2 | 30 |

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| ***15. Infrastructure*** | | |
| ***Textbook***   * . “Automatic Control Engineering” by Francis H. Raven. (( Text Book))   ***References***   * “Modern Control Systems” by Robert H. Bishop * “Modern Control Engineering” by OGATA. * “Feedback control system” by\ Dazza & Houper * “Automatic control system” by\B. C. Kuo * “Modern control system” by\Richard C. Dart   ***Others***   * Subjects from Internet | Required reading:  · CORE TEXTS  · COURSE MATERIALS  · OTHER | |
| * .Matlab 14 | Special requirements (include for example workshops, periodicals, IT software, websites) | |
| * .Guest Lecturers | Community-based facilities  (include for example, guest  Lectures , internship , field studies) | |
| ***16. Admissions*** | | |
|  | | Pre-requisites |
| 45 | | Minimum number of students |
| 65 | | Maximum number of students |
| ***Instructor:***    **Dr. Karim Hassan Ali**  ***Teaching Assistant:*** | | ***17. Course Instructors*** |

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