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| unilogo1.gifShoubra Faculty of Engineering | Untitled.jpgUntitled.jpgUntitled.jpgUntitled2.jpgCourse Specifications : Advanced automatic control | Untitled2.jpg  |
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| **University** : Benha university |

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| **Faculty** : Shoubra Faculty of Engineering |

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| **Department** : Mechanical Engineering Department  |

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| **1- Course Data**  |
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| Course Code : MDP444 | Course Title : Advanced automatic control | Study Year : Fourth Year |
|  Specialization  | : Production Mechanical Engineering Department |
| Teaching Hours:  |
| Lecture : 3 | Tutorial : 2 | Practical :  |  |

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| **2-  Course Aim**  |
| For students undertaking this course, the aims are to: |
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| 2.1- List concepts, principles of Automatic control  |
| 2.2- State basic principles and stability of control systems  |
| 2.3- Provide students with solid understanding of controller designs and compensation techniques  |

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| **3- Intended Learning Outcomes of Course (ILOS)**  |
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| **a-  Knowledge and Understanding**  |
| On completing this course, students will be able to: |
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| a- 1- Demonstrate the basics of information and communication technology (ICT) (A.1).  |
| a- 2 – Illustrate the methodologies of solving engineering problems, data collection interpretation (A.4) .  |
| a- 3 – Define current engineering technologies as related to Advanced automatic control (A.10).  |

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| **b-  Intellectual Skills**  |  |
| At the end of this course, the students will be able to: |  |
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| b- 1 - Think in a creative and innovative way in problem solving and design (B.2).  |
| b- 2 - Assess and evaluate the characteristics and performance of components, systems and processes (B.5)..  |
| b- 3 - Investigate the failure of components, systems, and processes (B.6)..  |
| b- 4 - Create systematic and methodic approaches when dealing with new and advancing technology (B.1).  |
| b- 5 - Analyze fluid power systems, subsystems and various control valves (B.8). |

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| **c-  Professional Skills** |  |
| On completing this course, the students are expected to be able to: |  |
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| c- 1 - Create and/or re-design a process, component or system, and carry out specialized engineering designs (C.2). |
| c- 2 - Exchange knowledge and skills with engineering community and industry (C.1).  |
| c- 3 - Write computer programs pertaining to mechanical power and energy engineering (C.7) |

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| **d-  General Skills**  |  |
| At the end of this course, the students will be able to: |  |
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| d- 1 - Collaborate effectively within multidisciplinary team (D.1).  |
| d- 2 - Work in stressful environment and within constraints (D.2).  |
| d- 3 - Communicate effectively (D.3). |
| d- 4 - Effectively manage tasks, time, and resources (D.6).  |

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| **4- Course Contents**  |
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| **No.** | **Topics** |
| 1 | Introduction &mathematical basic Concepts (control system, open loop, closed loop), Laplace Transform, D. E. |
| 2 | Modeling of physical systems Mechanical, Electrical |
| 3 | Modeling of physical systems Hydraulic, Pneumatic, Thermal |
| 4 | Transfer function, block diagram  |
| 5 | Time response analysis for 1st order and 2nd order with matlab application  |
| 6 | Steady state error analysis with matlab application |
| 7 | State representation with Matlab application |
| 8 | Salutation of state equations controllability and observability & Design of Industrial controllers P, PI, PD, PID  |
| 9 | Stability analysis, Rauth arrays, Nyquist |
| 10 | Bode plot and bode stability |
| 11 | Compensations Techniques  |
| 12 | Root locus technique |

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| **5- Teaching and Learning Methods**  |
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| 5.1- Lectures  |
| 5.2- Class activity  |
| 5.3- Assignments / homework  |

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| **6- Teaching and Learning Methods of Disables** |
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| 6.1- Practical training / laboratory  |
| 6.2- Seminar / workshop  |
| 6.3- Case study  |

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| **7- Student Assessment**  |
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| **a- Student Assessment Methods** |
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| 1 | Assignments  to assess   knowledge and intellectual skills.  |
| 2 | Quiz  to assess   knowledge, intellectual and professional skills.  |
| 3 | Mid-term exam   to assess   knowledge, intellectual, professional and general skills.  |
| 4 | Oral exam   to assess   knowledge and intellectual skills.  |
| 5 | Final exam   to assess   knowledge, intellectual, professional and general skills.  |

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| **b- Assessment Schedule** |  |
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| **No.** | **Assessment** | **Week** |
| 1 | Assignments  | 2, 3, 5, 9, 11, 12 |
| 2 | Quizzes | 4, 6, 10, 12 |
| 3 | Mid-term exam  | 8 |
| 4 | Oral exam  | 14 |
| 5 | Final exam  | 15  |

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| **c- Weighting of Assessments** |  |
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| **Assessment** | **Weight** |
| Mid\_Term Examination | 10 % |
| Final\_Term Examination | 60 % |
| Oral Examination | 20 % |
| Practical Examination | 00 % |
| Semester work | 05 % |
| Other types of assessment | 05 % |
| Total | 100 % |

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| **8- List of References**  |
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| **a- Course Notes** |
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| 1- prepared by instructor  |

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| **b- Books** |
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| 1- Engineering Vibration Analysis with Application to Control Systems, Edward Arnold, 1995  |

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| **c- Recommended Books** |
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| 1- Practical Balancing of Rotating Machinery, Elsevier, 2006  |

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| **d- Web Sites** |
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| 1- www.controlengineer.com  |

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| **- Course Coordinator :    Saber Mahmoud Abed Rabbo Tith** |
| **- Head of Department : Ahmed Maged ahmed Osman** |



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| **University** : Benha university |

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| **Faculty** : Shoubra Faculty of Engineering |

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| **Department** : Mechanical Engineering Department  |

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| **Matrix of Knowledge and Skills of the course**  |
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| **No.** | **Topics** | **week** | **Basic Knowledge** | **Intellectual Skills** | **Professional Skills** | **General Skills** |
| 1 |  Introduction ‎&mathematical basic ‎Concepts (control system, ‎open loop, closed loop), ‎Laplace Transform, D. E.‎ |  1 | a1 | b1 |  |  |
| 2 |  Modeling of physical ‎systems Mechanical, ‎Electrical |  2 | a2 | b1, b2 | c1 | d1 |
| 3 |  Modeling of physical ‎systems Hydraulic, ‎Pneumatic, Thermal |  3 | a1, a2 | b3 | c2 | d1, d2 |
| 4 |  Transfer function, block ‎diagram ‎ |  4 | a3 | b4 | c3 | d3 |
| 5 |  Time response analysis for ‎‎1st order and 2nd order ‎with matlab application ‎ |  5 | a3 | b2 | c1,c2 | d2 |
| 6 |  Steady state error analysis ‎with matlab application |  6 | a1, a3 | b1, b2 | c1 | d1, d2 |
| 7 |  State representation with ‎Matlab application |  7 | a1, a2 | b2, b3 | c2, c3 | d1, d2 |
| 8 |  Midterm exam |  8 | a3 | b2, b3 | c3 | d3 |
| 9 |  Soultution of state ‎equations controllability ‎and obserbavility & ‎Design of Industrial ‎controllers P, PI, PD, PID ‎ |  9 | a1, a2 | b1, b3 | c1,c2 | d1, d2 |
| 10 |  Stability analysis, Rauth ‎arrays, Nyquist |  10 | a2, a3 | b1, b2 | c1 | d3, d4 |
| 11 |  Bode plot and bode ‎stability |  11 | a1, a2 | b3 | c2, c3 | d1, d3 |
| 12 |  Compensations ‎Techniques ‎ |  12 | a3 | b4 | c3 | d4 |
| 13 |  Root locus technique |  13 | a1, a2, a3 | b1 | c3 | d4 |
| 14 |  Design of modern ‎controller based on phase ‎lead and lag |  14 | a1, a2, a3 | b1, b2, b3, b4 | c1,c2,c3  | d1, d2, d3, d4 |

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| **- Course Coordinator :    Saber Mahmoud Abed Rabbo Tith** |

 **- Head of Department : Ahmed Maged ahmed Osman**

 **Matrix of course content and ILO’s**

**Course Title**: Advanced automatic control **Code**: MDP444 **Lecture**: 3 **Tutorial:** 2 **Practical**: **Total:**  5

**Program on which the course is given:** B.Sc. Mechanical production Engineering

**Major or minor element of program:** N.A.

**Department offering the program:** Mechanical EngineeringDepartment

**Department offering the course:** Mechanical EngineeringDepartment

**Academic year / level: 2013-2014 forth Year / first semester**

**Date of specifications approval:** 16/3/2010

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|  | **K& U**  | 1. **S.**
 | **P. S.** | **G.&T. S.** | **Teaching Methods** | **Assessment Methods** |
| **Course contents** | **a1** | **a2** | **a3** | **b1** | **b2** | **b3** | **b4** | **b5** | **c1** | **c2** | **c3** | **d1** | **d2** | **d3** | **d4** | Lectureself-training | Tutorial assignment,quizzes, oral exams and written final exam |
| Introduction &mathematical basic Concepts (control system, open loop, closed loop), Laplace Transform, D. E. |  ✓ |  |  | ✓ |  |  |  |  |  |  |  |  |  |  |  | lecture tutorial |
| Modeling of physical systems Mechanical, Electrical |  | ✓ |  |  | ✓ | ✓ |  | ✓ |  | ✓ |  |  | ✓ |  | ✓ | lecture tutorial |
| Modeling of physical systems Hydraulic, Pneumatic, Thermal | ✓ | ✓ |  |  | ✓ |  |  |  |  |  |  |  |  | ✓ |  | lecture tutorialteam work |
| Transfer function, block diagram  |  |  | ✓ |  |  |  | ✓ | ✓ |  |  |  |  |  |  | ✓ | lecture tutorial |
| Time response analysis for 1st order and 2nd order with matlab application  |  | ✓ |  |  | ✓ |  |  |  | ✓ |  |  |  | ✓ |  |  | lecture tutorialteam work |
| Steady state error analysis with matlab application |  |  | ✓ |  |  | ✓ |  |  | ✓ |  |  | ✓ | ✓ |  |  | lecture tutorial |
| State representation with Matlab application | ✓ |  |  | ✓ |  | ✓ |  |  |  | ✓ | ✓ |  | ✓ |  |  | lecturetutorialteam work |
| Soultution of state equations controllability and obserbavility & Design of Industrial controllers P, PI, PD, PID  |  |  |  | ✓ |  |  |  | ✓ |  |  | ✓ | ✓ |  |  |  | lecturetutorial |
| Stability analysis, Rauth arrays, Nyquist | ✓ | ✓ |  | ✓ |  |  |  |  | ✓ |  |  |  |  | ✓ | ✓ | lecturetutorial |
| Bode plot and bode stability |  | ✓ | ✓ |  |  | ✓ |  |  | ✓ | ✓ | ✓ | ✓ |  | ✓ |  | lecturetutorial |
| Compensations Techniques |  |  | ✓ |  |  |  | ✓ |  | ✓ |  | ✓ |  |  |  | ✓ | lecturetutorialteam work |
| Root locus technique | ✓ | ✓ | ✓ | ✓ |  |  |  |  |  |  | ✓ |  |  |  | ✓ | lecturetutorial |
| Introduction &mathematical basic Concepts (control system, open loop, closed loop), Laplace Transform, D. E. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Lectureself-training |
|  | 6 | 7 | 7 | 7 | 5 | 5 | 3 | 4 | 6 | 4 | 6 | 4 | 5 | 4 | 6 |  |  |

 **Matrix of course aims and ILO’s**

**Course Title**: Advanced automatic control **Code**: MDP444 **Lecture**: 3 **Tutorial:** 2 **Practical**: **Total:**  5

**Program on which the course is given:** B.Sc. Mechanical production Engineering

**Major or minor element of program:** Major.

**Department offering the program:** Mechanical EngineeringDepartment

**Department offering the course:** Mechanical EngineeringDepartment

**Academic year / level: 2012-2013 First Year / first semester**

**Date of specifications approval:** 16/3/2010

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| **Course aims** | **K& U**  | **ll.S.** | **P. S.** | **G&T.S** |
| **a1** | **a2** | **a3** | **a4** | **b1** | **b2** | **b3** | **b4** | **b5** | **c1** | **c2** | **c3** | **d1** | **d2** | **d3** |
| 2.1- List concepts, principles of Automatic control  | ✓  |  | ✓ |  |  |  |  | ✓ |  |  |  |  | ✓ |  |  |
| 2.2- State basic principles and stability of control systems  | ✓ |  |  |  |  |  | ✓ |  |  |  | ✓ |  | ✓ | ✓ |  |
| 2.3- Provide students with solid understanding of controller designs and compensation techniques  |  | ✓ |  | ✓ |  |  |  | ✓ |  |  |  |  | ✓ |  | ✓ |

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| **- Course Coordinator :    Saber Mahmoud Abed Rabbo Tith** |
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 **- Head of Department : Ahmed Maged Ahmed Osman**