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| **Shoubra Faculty of Engineering** | Course Specifications : programmable logic controller plc |   |
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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 : MDP443 | Course Title : programmable logic controller plc | Study Year : Fourth Year |
| Specialization :  |  |
| 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- Put technical specification and data sheet of PLCs  |
| 2.2- Analyze any logic problems and write the logic equations  |
| 2.3- Convert the logic equation into ladder diagrams, Statement list or function block  |
| 2.4- Write PLC ladder program which include Logic, timers, counters and mathematical‎  |

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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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| 1- Define terminologies used inengineering related toPLC. (A.3). |
| a- 2- Demonstrate and understand the basic principles ofthe PLC, Input devices‎, Output devices and ‎actuators , PLC logic. (A5) |
| a- 3 - Basic electrical, control and computer engineering subjects related to the PLC.‎ (A4) |
| a- 4 - Engineering design principles and techniques used in PLC.‎ (A11) |

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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 - Assess the differences between Input devices, and Output devices.(B1) |  |
| b- 2 –describe the different steps to get Ladder diagram ‎programs (B.6). |  |
| b- 3 - Investigate the PLCs sensors (B.8).b- 4) Solve engineering problems, often on the basis of limited and possibly contradicting information(B7). |  |
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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(D1).  |
| d- 2) Work in stressful environment and within constraints(D2).  |
| d- 3) Communicate effectively(D3).  |

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| **4- Course Contents**  |
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| **No.** | **Topics** |
| 1 | Introduction to PLC ‎structure.,‎ |
| 2 | Input devices ‎ |
| 3 | Output devices and ‎actuators , PLC logic ‎ |
| 4 | Ladder diagram ‎programming ‎ |
| 5 | Ladder Programming ‎application and case ‎studies ‎ |
| 6 | PLCs sensors |
| 7 | PLC logic ad K map |
| 8 | Timers applications |
| 9 | Timers applications |
| 10 | Master control relay application |
| 11 | Internal relays, Shift registers, Data handling |
| 12 | mathematical application of PLC process  |
| 13 | Test and debugging |

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| **5- Teaching and Learning Methods**  |
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| 5.1- Lectures  |
| 5.2- Practical training / laboratory ‎ ‎  |
| 5.3- Case study  |
| 5.4- Assignments / homework  |

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| **6- Teaching and Learning Methods of Disables** |
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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 ‎  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.‎  |
| 6 | reports  to assess   knowledge and experience gained  |

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| **b- Assessment Schedule** |  |
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| **No.** | **Assessment** | **Week** |
| 1 | Assignments ‎ | ‎1, 5, 7, 10, 11, 12, and 13 ‎ |
| 2 | Quizzes ‎ | 5, 10 |
| 3 | Mid-term | 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 | 10 % |
| Practical Examination | 10 % |
| Semester work | 10 % |
| Other types of assessment | 0 % |
| Total | 100 % |

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| **8- List of References**  |
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| **a- Course Notes** |
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| 1- Course Power point presentation prepared by instructor. ‎  |

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| **b- Books** |
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| 1- Programming Logic Controllers: The Industrial Computers by Costanzo, 2009‎  |

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| **c- Recommended Books** |
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| 1- PLC device and Logic Controllers by Perez, Prentice Hall 2009‎  |

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**-Course Coordinator :    Saber abdraboo****- Head of Department : Ahmed Maged Ahmed Osman** |



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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 to PLC ‎structure.,‎ |  1 |  a1 |  b.1, b.4 |  c1 |   |
| 2 |  Input devices ‎ |  2 |  a.2 |  b.1 |  c.3 |  d1 |
| 3 |  Output devices and ‎actuators , PLC logic ‎ |  3 |   |  b.4 |  c. 3 |  d1‎ |
| 4 |  Ladder diagram ‎programming ‎ |  4 |  a.2, a.3 |  b.2 |   |   d.1‎ |
| 5 |  Ladder Programming ‎application and case ‎studies ‎ |  5 |  a.4 |  b.4 |   c3, c.2 |  ‎d1 ‎ |
| 6 |  PLCs sensors |  6 |   |  b.1 |  c.2, c.1 |  d.1 ‎ |
| 7 |  PLC logic ad K map |  7 |  a.2 |   b1 |  c.2 |  d.2 |
| 8 |  Mid term exam |  8 |   |   |   |   |
| 9 |  Timers applications |  9 |  A1,a.4 |   |  C1 |  d1 |
| 10 |  Timers applications |  10 |   |   |  c.1, c.3 |  d3 |
| 11 |  Master control relay application |  11 |  a.4, a.3 |   |  c1,c.2 |  d1 |
| 12 |  Internal relays, Shift registers, Data handling |  12 |  a.1, a.3 |   |  c.2 |  d.3 |
| 13 |  mathematical application of PLC process  |  13 |  a1,a.2 |   |   |  d.2 |
| 14 |  Test and debugging |  14 |  a.3 |   |  c2 |  d1 |
| 15 |  Final exam |  15 |   |   |   |   |

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| **- Course Coordinator :    Saber abdraboo** |
| **- Head of Department : Ahmed Maged Ahmed Osman****Matrix of course content and ILO’s****Course Title**: programmable logic controller plc **Code**: MDP443 **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 First Year / first semester** **Date of specifications approval:** 16/3/2010

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| **Course contents** | **a1** | **a2** | **a3** | **a4** | **b1** | **b2** | **b3** | **b4** | **c1** | **c2** | **c3** | **d1** | **d2** | **d3** |
| Introduction to PLC ‎structure.,‎ |  ✓ |  |  |  | ✓ |  |  | ✓ | ✓ |  |  |  |  |  |
| Input devices ‎ |  | ✓ |  |  | ✓ |  |  |  |  |  | ✓ | ✓ |  |  |
| Output devices and ‎actuators , PLC logic ‎ |  |  |  |  |  |  |  | ✓ |  |  | ✓ | ✓ |  |  |
| Ladder diagram ‎programming ‎ |  | ✓ | ✓ |  |  | ✓ |  |  |  |  |  | ✓ |  |  |
| Ladder Programming ‎application and case ‎studies ‎ |  |  |  | ✓ |  |  |  | ✓ |  | ✓ | ✓ | ✓ |  |  |
| PLCs sensors |  |  |  |  | ✓ |  |  |  | ✓ | ✓ |  | ✓ |  |  |
| PLC logic ad K map |  | ✓ |  |  | ✓ |  |  |  | ✓ |  |  | ✓ |  |  |
| Timers applications | ✓ |  |  | ✓ |  |  |  |  | ✓ |  |  | ✓ |  |  |
| Timers applications |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Master control relay application |  |  |  |  |  |  |  |  | ✓ |  | ✓ |  |  | ✓ |
| Internal relays, Shift registers, Data handling |  |  | ✓ | ✓ |  |  |  |  | ✓ | ✓ |  | ✓ |  |  |
| mathematical application of PLC process  | ✓ |  | ✓ |  |  |  |  |  |  | ✓ |  |  |  | ✓ |
| Test and debugging | ✓ | ✓ |  |  |  |  |  |  |  |  |  |  | ✓ |  |
| Introduction to PLC ‎structure.,‎ |  |  | ✓ |  |  |  |  |  |  |  | ✓ | ✓ |  |  |

 **Matrix of course aims and ILO’s****Course Title** programmable logic controller plc **Code**: MDP443 **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: 2013-2014 First Year / first semester** **Date of specifications approval:** 16/3/2010

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| **Course aims** | **a1** | **a2** | **a3** | **a4** | **b1** | **b2** | **b3** | **b4** | **c1** | **c2** | **c3** | **d1** | **d2** | **d3** |
| 2.1- Put technical specification and data sheet of PLCs  | ✓  |  | ✓ |  |  | ✓ |  | ✓ |  |  |  | ✓ |  |  |
| 2.2- Analyze any logic problems and write the logic equations  |  | ✓ |  | ✓ |  |  | ✓ |  | ✓ |  | ✓ |  | ✓ |  |
| 2.3- Convert the logic equation into ladder diagrams, Statement list or function block  | ✓ |  | ✓ |  |  | ✓ |  |  | ✓ |  |  | ✓ |  | ✓ |
| 2.4- Write PLC ladder program which include Logic, timers, counters and mathematical‎  |  | ✓ |  | ✓ |  | ✓ | ✓ |  | ✓ |  | ✓ |  |  |  |

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| **- Course Coordinator : Saber abdraboo** |

 **- Head of Department : Ahmed Maged Ahmed Maged** |