***Course Specifications of:***

***Programmable logic Controllers*(*MET503*)**

**Program(s) on which the course is given:** Diploma in Industrial Processes Control

**Compulsory or Elective element of program**:Elective

**Department offering the program:** Mechanical Engineering

**Academic year / Level:** year/ 2014/2015

**Date of specification approval: 2012**

1. **Basic Information**

**Title:*Programmable logic controllers* Code: MET503**

**Credit Hours: 3 Lecture: 3**

**Tutorial: Practical: Total: 3**

**B- Professional Information**

1. **Overall aims of course**

-Ability to convert from one numbering system to another and express binary numbers in 2scomplement and add them.

-Ability todescribe major components in a PLC and their functional operation.

-. Describe a typical PLC processor scan to include how the PLC processes the ladder diagram.

-Ability to Demonstrate ability to write, edit, debug, and analysis PLC programs. Develop and troubleshoot/debug PLC programs using written program

1. **Intended learning outcomes of course (ILOs)**

By completion of the course, the student should be able to:

**2.1 Knowledge and understanding**

2.1.2 List ethical and legal principles of professional practice in the area of industrial processes control.

2.1.4 Explain the effect of professional practice on the environment and work towards its conservation and maintenance.

2.1.5 Demonstrate methodologies and computer tools available for analysis and design of mechanical engineering systems;

**2.2 Intellectual skills**

2.2.1 Discern and analyze the problems in the area of industrial process control and categorize them according to their priority.

2.2.3 Critically and analytically read research papers and topics related to his/her area of industrial processes control.

2.2.5 Make professional decisions in the light of available information.

2.2.6 Evaluate data sources and make sound judgments in the absence of complete data;

**2.3 Professional and practical skills**

2.3.1 Apply professional skills in the area of industrial processes control.

2.3.2 Prepare professional reports.

2.3.3 Plan and implement experiment design and evaluate testing

**2.4 General and transferable skills**

2.4.2 Use information technology in order to serve the development of professional practice.

2.4.3 Assess him/her-self and identify his/her own personal learning needs.

2.4.5 Work in a group and manage time effectively.

2.4.7 Conduct self-learning and continuous education practices.

1. **Contents**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No of weeks** | **Topic** | **No. of hours** | **Teaching / learning methods and strategies** | **Assessment method** |
| 1 | Introduction to PLC and its applications  PLC Hardware and Software | 3 | Lecture,Class activity | - |
| 2 | PLC Functions and Terminology, PLC Installation and Setup, PLC Programming Basics | 3 | Lecture./Assign, case study | Assignment 1 |
| 3 | Relay Logic Instructions | 3 | Lecture, Class activity | Assignment 1 |
| 4 | Pneumatic logic gates | 3 | Lecture,Class activity | Assignment 2 |
| 5 | Timers and Counters | 3 | Lecture/Assign. | Assignment 2, Quiz |
| 6 | Shift registers,  Industrial applications | 3 | Lecture,Class activity | Assignment 3 |
| 7 | Stacks  Arithmetic operations  Industrial applications | 3 | Lecture,Class activity | Assignment 3, Quiz |
| 8 | **Midterm exam** | | | |
| 9 | Proportional–integral–derivative'controller''(PID) | 3 | Lecture/Assign. | Assignment 4 |
| 10 | Communication/read write wired in microcontrollers | 3 | Lecture, Class activity | Assignment 4, , Quiz |
| 11 | ''HMI'SCADA' 1/2 | 3 | Lecture/Assign. | Assignment 5 |
| 12 | ''HMI'SCADA' 2/2 | 3 | Lecture, Class activity | Assignment 5 |
| 13 | PLC Safety Procedures | 3 | Lecture, Class activity | Quiz |
| 14 | Connecting field devices to I/O Cards | 3 | Lecture, Case Study | Oral Exam |
| 15 | **Final exam** | | | |

1. **Course Matrix**

|  |  |  |
| --- | --- | --- |
| **ILO’s code number** | **Teaching/learning methods and strategies** | **Assessment methods and strategies** |
| 2.1.1  2.1.2  2.1.3  2.1.4 | Formal lectures | Individual coursework assignments, quizzes, oral discussions and reports. Midterm and /or final written examination is given. |
| 2.2.1  2.2.2  2.2.3  2.2.4  2.2.5 | Analysis and problem‐solving skills are developed through tutorial/problem sheets and small group exercises.  Research skills are developed through a small subject oriented research project. | Analysis and problem‐solving skills are assessed through oral and written examinations.  Design and research skills are assessed through project write-ups, coursework and project reports. |
| 2.3.1  2.3.2  2.3.3 | Experiments demonstrations, practical work, laboratory visits. | Practical skills are assessed through laboratory experimental write-ups, coursework exercises and reports, project reports and presentations. |
| 2.4.1  2.4.2  2.4.3  2.4.4  2.4.5 | Those skills are not explicitly taught; however, along the course of study the student will acquire those skills to be able to perform his obligations. Attendance of seminars, workshops or conferences will help the student in developing those skills. Presentation by students (either group or individual) will train students for those skills. | Project presentation |

1. **Teaching and Learning Methods**

* Lectures
* Practical training / laboratory

Seminar / workshop

* Class activity
* Case study
* Assignments / homework

Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Student Assessment Methods**

* Assignments to assess knowledge and intellectual skills.
* Quiz to assess knowledge, intellectual and professional skills.
* Mid-term exam to assess knowledge, intellectual, professional and general skills.
* Oral exam to assess knowledge and intellectual skills.
* Final exam to assess knowledge, intellectual, professional and general skills.
* Other: Practical exam to assess knowledge, intellectual, professional and general skills.

1. **Assessment schedule**

Assessment 1 Assignments on weeks 2, 3, 4, 5 , 6, 7 ,9, 10, 11, and 12

Assessment 2 Quizzes on weeks 5, 7, 10, and 13

Assessment 3 Mid-term exam on weeks 8

Assessment 3 Oral exam on week 14

Assessment 4 Final exam on week 15

1. **Weighting of Assessments**

Mid-Term Examination 20%

Final-TermExamination 60%

Oral Examination 05%

Practical Examination 05%

Semester Work 10%

Other 00%

Total 100%

1. **List of References**
   1. **Course Notes**

* Course notes prepared by instructor
* PowerPoint slides.
  1. **Essential books (Text books)**
* Programmable Logic Controllers, Frank D. Petruzella, 4th edition, McGraw Hill publisher
* Programmable Logic Controllers Lab Manual, Frank D. Petruzella, 4th edition
* Programmable Logic Controllers., Max Rabiee 2nd ed., (2009) , Publisher: oodheart-Willcox Company, ISBN: 9781605250069
  1. **Recommended books;**

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| --- |
| [PLC Training.... How To Get Started!](http://www.thelearningpit.com/plc/plcs.html) |
| [LogixPro .... Allen Bradley RSLogix Simulator  Professor Bill's Advanced Ladder Logic Simulator](http://www.thelearningpit.com/lp/logixpro.html)     Today's Most Advanced PLC Training Simulator! |
| [LogixPro CD/Key Edition .... Now Available! Use at Home, School and Office](http://www.thelearningpit.com/lp/buycd.html)    Allen Bradley RSLogix Training Anywhere, Anytime! |
| [LogixPro/RSLogix .... Documentation and Student Exercises](http://www.thelearningpit.com/lp/doc/index.html)    Tools and Resources for Allen Bradley RSLogix Training! |
| [PSIM .... The Original PLC Simulator / Emulator Proffessor Bill's Free PLC Simulator!](http://www.thelearningpit.com/plc/psim/psim.html)    Win7 Compatible Thanks to the Crew at DOSBox.com! |
| [PSIM .... Student Exercises and Documentation](http://www.thelearningpit.com/plc/psim/doc/index.html) |

* 1. **Periodicals & Websites.**

[www.plchome.com](http://www.plchome.com)

1. **Facilities Required for Teaching and learning**

* Lecture room with computer and data show
* Computer Laboratory.

**Course coordinator:**Prof. Dr. Saber AbdRabbo

**Course instructor: Date**10 /10 /2015

**Head of department:** Osama Ezzetabdellatif