



دبلوم تطبيقات التحكم الأوتوماتيكي في نظم القوى الميكانيكية

MEP 599 Diploma Design Project

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مكق 599 – مشروع الدبلوم (آخر ترم في الدبلوم):

يتم الاعلان عن قائمة بعناوين وموضوعات المشروعات المتاحة في مختلف مجالات الدبلوم ويتم عرض نبذة عن هدف ومحتوى وخطة العمل في كل مشروع. تتضمن المشروعات عدة تطبيقات متنوعة ومختلفة عملية وباستخدام برامج المحاكاة على الحاسب الآلي حول أساليب التحكم في نظم القوى الميكانيكية. يقوم الطلبة (فرادى أو في مجموعات) باختيار والتسجيل في أحد المشروعات. يتضمن المشروع تطبيق المفاهيم والتقنيات التي إكتسبها الطالب على إمتداد الدراسة في الدبلوم. يقدم الطلبة عرضاً وتقريراً مفصلاً عن المشروع ويتم إمتحان الطالب شفويماً أثناء ذلك العرض .

What do we have in the Diploma Design Project Course?

MEP 599 – Project:

Contents: This is a special applied course (with no final term exam), all grades are based on the In-term works). The ACC Lab Manager announces, before the beginning of the Term, a list containing the Titles of Projects available in different areas of Applications of Automatic Control of Mechanical Power Systems. That list also includes an abstract, an objective a work-plane and the optimum number of students suggested for Each Project. The students (in small groups) select and register in one of the projects. The projects allow the students to apply the engineering concepts, skills, and techniques acquired during their study in the Diploma. After or during the end of the term exams, the students must submit a project report and present an oral presentation during which which an oral exam is performed.

Course Specifications & Basic Information

1. Title:	Heat and Mass Transfer			Code:MEP590
2.Credit hrs per week	Lectures= 3 hours per week	Tutorial= 0.0	Practical= 0.0	Total=3 Cr.Hrs

B- Professional Information

1. Course description: Overall Aims:

This is a special applied mandatory one course of the 6 mandatory courses requirements of the Diploma. Students take this course in the last term of the Diploma. The course is designed to verify the ILO's of the program and to prove that students understand various types of automatic control systems in mechanical power & energy transfer processes. This course has neither term-work sheets, report assignments nor a written, formal final-term exam. All course grades are thus based upon the in-term project progress works, the project final oral presentation & the project written technical report to be submitted before the oral presentation. Course overall aims is to test that students will be capable to (depending on the project subject):

- Apply & use his technical skills and previously gained knowledge (in various automatic control fields/courses covered during the diploma) in order to perform a professional work to design, calculate, analyze, test, report, and present a practical & applicable automatic control system.
- To identify technological and automatic control problems of mechanical power systems and to suggest reasonable, efficient, most-economic, and effective-optimum solutions for those problems.
- To his use professional skills to select proper new technologies for various control applications.
- To use self-E-learning and virtual lab programs and PC applications (Mat lab, AutoCAD, etc).
- To organise and manage time and all resources effectively; for short/long term commitments.

2. Intended Learning Outcomes of Course (ILOs):

a) Knowledge and Understanding:

Having successfully completed this course, the post-graduate student should have knowledge and understanding of:

- Various types of automatic control systems in mechanical power & energy transfer processes.
- Basics, various definitions & terminologies associated with automatic control systems.
- Requirements of on-line interactive virtual lab programs to study and analyze control systems.
- Essential components of control loops/circuits in many applications of mechanical power systems.
- Conservation eqns.& transfer functions of different types of automatic control systems/processes.
- Basics & requirements of performing a short-term project in different automatic control fields.
- How to integrate various subjects, knowledge, understanding, & skills into specific project task.
- How to integrate human resources & available materials into team project due at a specific time.

b) Intellectual Skills:

Having successfully completed this course, the student should have the ability to do:

- Select and apply appropriate technical and optimum method in doing engineering design and analysis of automatic control problems.
- Searching for scientific information and adopting automatic control self-E-learning capabilities. automatic control systems.
- Apply the concepts of control software simulation, diagnostics and operation of various practical automatic control systems.
- Compare between various types of processes, components, & complete control systems/circuits.

c) Professional and Practical Skills:

Having successfully completed this course, the student should have the ability to do:

- Identify several types of automatic control problems which are essential for design and operation of mechanical power systems and energy transfer processes.
- Perform professional design and modelling for different automatic control systems.
- Suggest possible alternative solutions for various types of components and parts.
- Diagnose efficiency and performance of different types of control circuits/systems.

d) General and Transferable Skills:

Having successfully completed this course, the student should have the ability to do:

- Perform engineering calculations, draw feed-back control circuits, block diagrams, graphical presentation of experimental data, and perform data-regression analysis.
- Transfer knowledge, Work in group, & Communicate in written & oral forms, in English.
- Use IT& evolutionary technological tools& PC applications (Excel, Mat lab, Virtual labs, .etc).
- Prepare and write reports, Manipulate and sort data, Think logically, and continuous self-E-learning.
- Identify practical problems, compare between different technologies for measurement systems.
- Organise & manage time & resources effectively; for short-term and longer-term commitments.



التعريف بمشروعات التحكم للدبلوم باستخدام تقنيات المعامل الافتراضية

المشرف على المشروع: أ.م. / محسن سيد سليمان

Project title: Investigation & Verification of Automatic Control Virtual Labs

Introduction: What are Virtual Control Labs for Mechanical Power Systems?

Modern Applications for PCs and ITs have produced new types of Virtual Lab Programs work on PCs and simulate to a great extent real Automatic control Systems. These Virtual Labs consist of and display many essential control-boards and instrumentation-panels which are identical and also do the same functions as many industrial automatic control systems existing in practical mechanical power systems. These interactive Virtual Labs include also flow visualization of various fluids moving in the system under investigation. These labs are specially designed to give user a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in industrial mechanical power systems such as operation and control of electric power generation Steam-plant or operation and control of refrigeration and freezing plant or solar heating system...etc.

The objective of Virtual control labs is to show the engineer all types of input and output signals and the control procedures used in many complicated automatic control systems. For this reason, the simulations include many critical control alarms, temperature and pressure read-out meters, flow control valves, operation and instrumentation parameter-boards, diagnostic tools, error-report filling, and help/trouble-shooting menus. Further more the Virtual Labs perform many types of Thermal or Heat Balance Calculations and Plotting charts to get some required/important output values such as thermal efficiency of the plant or H-Q curve for a pump or the C.O.P of a refrigeration system.

Objectives of this design project:

- 1- Identifying the main concepts of industrial automatic control systems in many mechanical power applications by modern computer-based programs which simulate those practical control systems.
- 2- Investigation of many Applications Automatic Control Virtual Labs to understand their functions, how they work and what are their input & output signals ...etc (there are more than 16 virtual labs in ACC).
- 3- Verification of the accuracy and validity of the results obtained by those virtual labs through performing engineering and scientific calibrations for those virtual labs. The calibration is done by comparing internal calculations done by those virtual labs with external engineering calculations using thermo-dynamic, conservation equations, and thermo-fluid relations to get the same output results.
- 4- Training students and engineers on Technical Report Writing and Presentation Skills for each Lab.
- 5- Enhancing the skills of Searching for information and adopting self learning capabilities related to Automatic systems and modern computer technologies.

*** يوجد كتالوج تفصيلي لكل مشروع /معمل **Select only one of the following**

Note: These labs are only automatic control virtual labs (and are not normal experimental labs for thermo-fluids)

- THW-1 Simulation of Automatic Control Processes of a water-tube boiler heating unit with thermal balance calculation.
- THW-2 Simulation of Automatic Control Processes of a complete Steam Turbine Power Plant with thermal balance calculation.
- THW-3 Simulation of Automatic Control Processes of a complete Freezing & Refrigeration Plant with thermal balance calculation.
- THW-4 Simulation of Automatic Control Processes of a complete air conditioning HVAC plant with thermal balance calculation.
- THW-5 Simulation of Automatic Control Processes of a complete Heat Pump Plant with thermal balance calculation.
- THW-6 virtual Simulation of Automatic Control Processes of 4/2 stroke Otto engine.
- THW-7 virtual Simulation of Automatic Control Processes of 4/2 stroke Diesel engine.

- THW-8 Simulation of Automatic Control Processes of Diesel engine drives with thermal balance calculation.
- THW-9 Simulation of Automatic Control Processes of Diesel engine with hydraulic brake unit with thermal balance calculation.
- THW-10 Simulation of Automatic Control Processes of Principles of Hydraulics and Centrifuge Pumps (two programs).
- THW-11 Virtual Animated Sections of Automatic Control Processes of Hydraulic/oleodynamic components.
- THW-12 Virtual Simulation of Automatic Control Processes of Hydraulic circuits with 16 components.
- THW-13 Virtual Automatic Control Processes of Pneumatics circuits Q – L – U- 3 cylinders cycles
- THW-15 Virtual Automatic Control Process of a Solar plant with thermal balance calculation.
- THW-16 virtual Simulation of Automatic Control Process of a civil heating plant hot water with thermal balance calculation.

ملاحظات هامة:

- 1- لا يوجد امتحان تحريري في المشروع ولكن يتم تحديد موعد في نهاية الترم لتقديم التقرير عن المشروع وموعد لعمل الإمتحان الشفوي النهائي.
- 2- يتم كذلك الإعلان عن موعد مناسب قبل نهاية الترم لتحديد ما تم إنجازه في تقرير المشروع وعمل بروفة أولية على الإمتحان الشفوي النهائي.

خلاصة المطلوب في المشروع وتوزيع درجات المقرر الكلية (100 درجة)

أولاً- 50 درجة على تقديم تقرير هندسي لا يقل عن 100 صفحة حول كل مشروع ولا بد أن يتضمن 3 أجزاء رئيسية كما يلي:

- 1- تعريف تفاصيل البرنامج وتوضيح كل عناصر التحكم controlled variables وجميع وظائف ومدخلات ومخرجات منظومة التحكم التي تم دراستها.
- 2- التأكد من مصداقية البرنامج وعمل معايرة علمية لمخرجاته ونتائجه بالتحقق من كافة القوانين والحسابات الداخلية التي تتم في البرنامج وإجراء عمليات مقارنة تفصيلية بينها وبين الحسابات التقليدية اليدوية التي تم عملها للوصول لنفس مخرجات البرنامج (Doing complete heat balance analysis).
- 3- تحديد وتوصيف أمثلة لأجهزة التحكم (field devices, I/O sensors & actuators) المستخدمة في نظام التحكم الحقيقي من خلال بحث على النت.

(ملاحظة: المشروع يستفيد بكل ILO's وما سبق دراسته في المقرر الإجباري مكق 563- استخدام المعامل الافتراضية في تحليل نظم التحكم الأوتوماتيكي).

ثانياً- 50 درجة على تقديم عرض فني علني لا يقل عن 30 دقيقة لكل طالب يتضمن مايلي:

- 1- توضيح المهارات الشخصية وقدرات الطالب في استخدام أساليب power point & data show presentations في تقديم مخرجات ونتائج عمله.
- 2- توضيح قدرة ومهارة الطالب في توصيل المعلومات من خلال عرضه لمحتوى وأفكار التقرير الهندسي عن المشروع وتوضيح مدى تعاونه مع المجموعه
- 3- توضيح القدرة المهنية professional & technical skills والإحاطة بتفاصيل المشروع العلمية من خلال النقاش والرد على إستفسارات الممتحنين

أ.م/ محسن سيد سليمان

مدير معمل التحكم ACC ومسئول إدارة الدبلوم

رئيس مجموعة الموائع والمرشد الأكاديمي للمجموعة

مدير وحدة ضمان الجودة في القسم

مق 599- مشروع دبلوم تطبيقات التحكم الأوتوماتيكي لعام 2015/2014 تحت إشراف أ.م/ محسن سليمان- منسق الدبلوم ومدير معمل التحكم ACC

إسم المشروع المقترح: تنفيذ جهاز/ وحدة متكاملة للتعليم والتدريب على برمجة وتشغيل أجهزة PLC (الحاكم المنطقي المبرمج)

Integrated Educational Training Kit for

Operation & Programming of Industrial Process Control & PLC Systems

مقدمة عامة- التجارب والمتطلبات الفنية التي يجب توافرها في الجهاز:

Overview:

- ✓ Educational Kit should allow for reliable training on engineering processes and PLC systems as close as possible to those in industrial and actual production.
- ✓ The Kit should allow for right "artificial" training processes that are economic, flexible and practical.
- ✓ In addition to Kit-hardware, required training system must include computer-aided Software, Virtual-Labs, and practical exercise methods that ensure very good expertise in automation and PLC technologies.

Technical Specifications and Requirements:

- ✓ Universal holder system with control systems, power supply unit and simulations.
- ✓ Alternative connections for 4mm safety sockets (if a circuit diagram to leads into controller configuration) and for SysLink (SubD or Centronics for complex circuits or if correct wiring is no longer a key focus).
- ✓ Table-top rack or A4 plate for A4 mounting frames.
- ✓ Variable equipment including market leading control systems and 19" simulation plates.
- ✓ Online configuration to provide support in selecting and combining the appropriate components.
- ✓ Flexible hardware & open for all kinds of control tasks.
- ✓ Very simple Kit to commission and to program.
- ✓ Compatible programming software system for range of industrial controllers.
- ✓ Training Kit is to allow for Ethernet communication for simple programming with module library.
- ✓ Software should allow for purely PC-based training in programming.

Requirements of Practical exercises and Training Course Documents:

- ✓ Demonstration and clarification of the use of sensors in automation.
- ✓ Demonstration and clarification of the use electro-Pneumatics into PLC technology.
- ✓ Provide a practical introduction to the world of field buses.

أ.م/ محسن سيد سليمان

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نماذج من أجهزة تجارية موجودة في السوق المحلي والعالمي

