Cairo University
Faculty of Engineering

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Mechanical Power Engineering Department

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Part (1)

Program Specification of
Diploma of Graduate Studies:

"Applications of Automatic Control of Mechanical Power Systems"
(As per the 2013/2014 Bylaws)

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توصيف برنامج دبلوم تطبيقات التحكم الأوتوماتيكى

طبقاً لمعايير ومواصفات ضمان الجودة NARS

(دبلوم خاص تحت إشراف وإدارة معمل التحكم الأوتوماتيكى ACC)

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Date: March 2015

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Diploma Program Specification (this file)

Program Specification

Cairo University **Faculty of Engineering**

A- Basic Information

1- **Program Title** : **Diploma of Graduate Studies (Applications of Automatic Control of Mechanical Power systems)**

2- Program Type : **Single √** **Double ☐** **Multiple ☐**

3- Department offering the program: **Mechanical Power Engineering Department**
(The ACC LAB in the MEP department operates and supervises this post-graduate Diploma)

4- Department Coordinator : **Prof. Dr. Ashref Sabery**

5- Program Coordinator : **Assoc. Prof. Dr. Mohsen S.Soliman**

6- External Evaluator:
(قامت اللجنة التخطيطية و هيئة مكتب قطاع الدراسات الهندسية بالمجلس الأعلى للجامعات بجلسة مشتركة رقم-2 بتاريخ 2011/9/22 بتشكيل لجنة فرعية-لإقرارتعديلات فى لائحة الدراسات العليا بالكلية ومنها إضافة لائحة جديدة لإنشاء الدبلوم الخاص الجديد - من كل من: أ.د.إبراهيم محمد شفيع طه، أ.د. مازن محمد شفيق عبد السلام ، أ.د. يحيي عبد العظيم حسانين، أ.د. شريف مراد- وكيل الكلية للدراسات العليا والبحوث)

7-* Last date of program specifications approval*: Faculty meeting on October 2012 (a recent program specifications approval was also taken on January 2015).
بعد موافقة وزيرالتعليم العالى ا.د.مصطفى مسعد- بالقرارالوزارى رقم 3938 بتاريخ 2012/9/4 بشأن إصدارالائحة الداخلية لكلية الهندسة جامعة القاهرة(مرحلةالدراسات العليا) بنظام الساعات المعتمدة–وتتضمن إنشاء الدبلوم الخاص:"تطبيقات التحكم الأوتوماتيكى فى نظم القوى الميكانيكية".

B- Program Context and Professional Information:

I. Program Vision:

To provide top-quality, distinguished education locally & internationally. To engage in automatic control training activities & projects which serve Egypt & Arab World needs and to help in nation development & improving quality of life. To provide post-graduate with international scientific capacity and distinguished technical skills in the field of automatic control of mech. power systems and energy and rationalization. This post-graduate should also have a high sense of belonging and dedication to Egypt and Arab Nation.

II. Program Mission:

To achieve a developing-high academic excellence and a top-quality educational and technical training environment capable of attracting distinguished graduates from both inside and outside. To have a post - graduate engineer who is highly competitive academically, professionally &ethically, and is also capable of performing scientific & applied automatic control projects. This engineer should be capable of improving his skills, increasing his knowledge and technical information, and of performing continuous learning, in line with international innovations in automatic control discipline and the related fields, and capable of doing effective and real contribution to sustainable development both in Egypt and in the Arab World.

III. Program Aims:

The program aims to develop and enhance the scientific capabilities and practical and professional skills of its post-graduate student in industrial and applied specialized fields which involve all types of automatic control loops/circuits, and advanced virtual labs applications in Mechanical Power Engineering Systems.

✓ **The program aims to develop and create distinguished aspects or characteristics of its post-graduate students by providing them a top-quality advanced education, sufficient practical & application-oriented training and great self-learning experience in the fields of PC & IT tools all in automatic control systems, virtual lab packages, Hydraulic/Pneumatic circuits, SCADA systems, PLC & micro-controller technology.**

✓ **The program aims also to assist and continuously follow up post-graduates to get advanced training, to find distinguished jobs related to automatic control fields and to purse M.Sc. and Ph.D. studies, as well as to enhance their technical and social potentialites to perform their roles in the society.**

By the completion of this Diploma, the post-graduate will be capable:

1- **To understand various types of automatic control loops in mechanical power and energy transfer systems.**
2- **To apply his knowledge in professional work in fields of operation, control & management of mech. power systems, energy rationalization processes in power plants, HVAC & refrigeration units, and ICE systems.**
3- **To identify technological and automatic control problems of mechanical power systems and to suggest the reasonable, efficient, most-economic, and effective-optimum solutions for those problems.**
4- **To use his professional skills to select proper new technologies for various automatic control applications.**
5- **To use self-E-learning and virtual lab programs and PC applications (Mat lab, AutoCAD, SCADA, ..etc).**
6- **To organise and manage time and all resources effectively; for short-term and longer-term commitments.**
7- **To manage work entitled, perform engineering calculations, transfer knowledge, communicate in written reports and oral forms, both in Arabic & English, work in a group in a specific project , manipulate and sort data, use of IT and evolutionary technological tools, and to think logically.**

IV- Program Job opportunities:

Upon completion of this Diploma, the post-graduate engineer should be capable of working in all types of automatic control jobs in:

a) **Power stations and petrochemical plants and Processing or user industries.**
b) **Management in industries and mechanical power engineering projects.**
c) **Establishments concerned with cars, ships, energy generation or aerospace, refrigeration and HVAC.**
d) **Safety control fields and environmental protection and pollution control areas.**
e) **Relevant research and development Institutes related to automatic control aspects.**

3- Academic Standards for the Diploma:

The academic standards of the program are designed and adapted to satisfy the criteria presented in NARS (as given in Appendix-2).

Attributes of program graduates as per NAQAAE Requirements for Diploma programs:

1. **Apply the acquired knowledge in his/her profession.**
2. **Identify professional problems and propose appropriate solutions for their problems.**
3. **Master professional skills and use the most appropriate technological tools in professional practice for improving teaching process.**
4. **Communicate and lead teams through systemic professional work.**
5. **Make decisions in the light of available information.**
6. **Utilize available resources efficiency.**
7. **Display awareness of his/her role in community development and environmental conservation.**
8. **Act in a way that reflects his/her commitment to integrity and credibility, and accept accountability and taking responsibility for his/her action.**
9. **Realize of the need to develop him/hers self and engage in continuous education.**

4- General ILO's of the Diploma:

a- Knowledge and Understanding:

On successful completion of this Diploma the post-graduate should be able to demonstrate knowledge and understanding of:

1. **Theories, Information, sciences and specialized technologies in the fields of automatic control of mechanical power equipments and systems.**

2. Moral, legal essentials and quality control principals related to the graduate's professional practices in the automatic control fields.
3. Various effects of engineering professional practices on different components of the environment.
4. Methods used for emission/pollution control and energy rationalization and maximization of the benefits of new and renewable energies.

b- Intellectual Skills:

On successful completion of this Diploma the post-graduate should be able to:

1. Identify all scientific and practical problems related to automatic control of mechanical power systems.
2. Analyze and propose professional and technical solutions and algorithms for automatic control problems.
3. Analytical reading of research & report topics related to automatic control of mechanical power systems.
4. Evaluate and estimate various risks involved in professional practices related to automatic control fields.
5. Take effective actions & professional decisions in accordance with/based on available data and information.

c- Professional and Practical Skills:

On successful completion of this Diploma the post-graduate should be able to:

1. Apply professional and practical skills in the fields of automatic control of mechanical power systems.
2. Execute short term project & write engineering technical report that involves graphs, charts, and diagrams.
3. Perform professional presentation & suggest possible alternative solutions for automatic control problems.
4. Write technical requirements and selecting engineering reference standards for automatic control projects.

d- General and Transferable Skills:

On successful completion of the Diploma, the post-graduate engineer should be able to:

1. Perform engineering calculations, Draw control circuits, block diagrams, and hydraulic/pneumatic layouts.
2. Transfer knowledge, Work in group, and Communicate in written & oral forms, both in Arabic & English.
3. Use IT & evolutionary technological tools, and computer applications (Excel, Mat lab, Virtual labs, .etc).
4. Prepare and write reports, Manipulate and sort data, Think logically, and do continuous self E--learning.
5. Use computer software applications (Excel, EES, Mat lab, AutoCAD,…etc)
6. Identify practical problems, compare and select between different technologies for control systems.
7. Organise and manage time and resources effectively; for short-term and longer-term commitments.

5- *Detailed Intended Learning Outcomes (ILO's) of the Diploma:*

a- Knowledge and Understanding:

On successful completion of this Diploma the post-graduates should be able to demonstrate knowledge and understanding of:

a1- Basic facts, definitions, types of and components of different types of practical automatic control systems.
a2- Automatic control theory and concepts of mathematical modelling of various types of mech. power systems and energy transfer processes, element and the whole system transfer functions, and Block diagram analysis.
a3- Laplace Transform & inverse Laplace technique for solving system's ordinary time-dependent Diff. Eqns.
a4-Instantaneous dynamic response of control system and its graphical presentation on an output-time scale for various types of different input testing functions.
a5-Main definitions and characteristics of dynamic response of 1st and 2nd order automatic control systems.
a6-The analogy between various types of mechanical control systems and electric control systems.
a7-Essential requirements of accuracy, efficiency, safety, and stability of any automatic control system.
a8-Basics of experimental measurement definitions such as: transducers, uncertainty, accuracy, random or biased errors, hysteresis, impedance matching...etc.
a9- Importance of measurements and feed-back processes in closed-loop automatic control systems.
a10- Concepts& importance of Calibration, static response and dynamic response of a measurement system.
a11- Uncertainty analysis, statistical calculation of exper. measurement, and graphical data presentation.

a12- Various types of practical measurement transducers, types of signal conditioning devices, data acquisition hardware/software systems, and data output processing and display tools.
a13- Various equations for experimental error propagation and data uncertainty and statistical analysis.
a14- Different types of transducers and sensors used for measurement of electric signals, pressure, temperature, flow rate, flow velocity, force, ...etc.
a15-Basics of an on-line interactive virtual lab software for studying and analyzing hydraulic systems.
a16-Basics& components of Hydraulic circuits as types of automatic control systems for mechanical outputs.
a17-Various types of positive disp. Pumps, actuators, pressure valves, directional valves, flow valves, check valves, oil conditioning methods, oil conductors, and hydraulic circuit auxiliaries.
a18-Essentail types of hydraulic symbols used for presentation of all types of hydraulic circuits and systems.
a19-Concepts of reading hydraulic circuits schematics for proper analysis of the system function &its output.
a20-Requirements of a General on-line interactive virtlab program for studying and analyzing automatic control techniques of mech. power systems, heat transfer equipments, and energy efficiency processes.
a21-Structure of practical control virtlab, managements of control parameters, synoptic diagram, flow paths, instrumentation, control Boards, Operation buttons, alarm signals, system diagnostics, and output data.
a22-Concepts of verification and calibration of automatic control virtual lab programs.
a23- Basics of process sequential control and practical applications of industrial PLC Systems.
a24-Major functions and various components and expansion modules of different types of PLC systems.
a25- Structure of PLC languish for ladder logic diagram, statement list diagram, and function block diagram.
a26-Basics of programming, running, simulation, diagnostics and trouble-shooting of various PLC systems.
a27-Basics and requirements of performing a short-term design project in the fields of applications of automatic control of mechanical power systems and heat and mass transfer processes and equipments.
a28- Integration of various parts of subjects, knowledge and understanding into a specific project task.
a29- Integration of different human resources & available materials into a team project due at a specific time.

Electives:

a30- Concepts of main HVAC processes, functions and how to do them, and their inputs or outputs signals.
a31-Governing conservation eqns. Of the HVAC automatic control processes.
a32-Control parameters, Synoptic diagram, flow paths, instrumentation&control boards of HVACVirtualLab.
a33- Verification and calibration of a HVAC automatic control virtual lab program.
a34- Relation between heat transfer processes and thermodynamic processes.
a35- Different modes of heat transfer and their physical origin.
a36- Steady 1-D conduction, uniform &non-uniform thermal conductivity, heat sources, and extended surfaces.
a37- Different heat transfer processes involving free and forced convection problems.
a38- Multi-mode heat transfer problems and basic types and performance of heat exchangers.
a39-Fundamental Aspects of Pipe-Lines, Types and components of Piping Systems, Review of Hydraulic considerations, Major and Minor Losses in Piping Systems.
a40-Types of Pipe Fittings, Piping System Design and Calculations problems.
a41-Using Computer Software and numerical calculation methods in design & analysis of Piping systems.
a42-Types of Valves (functions, selections: hydraulic considerations, construction, ratings, materials, Flow through valves, pressure losses, design facts/parameters-Manual Valves(types, selection, and operation).
a43-Hydraulic& Pneumatic control valves (Pressure, Directional, check), and Types of Flow Meters.
a44-Advanced hardware& software components of many practical and actual PLC systems.
a45-Advanced applications detailed examples for all working steps showing how to design, build, configure, program, test, trouble-shooting and finally to run a PLC project.
a46-Typical PLC design projects to show the LAD, FBD & STL programs and to give the participants skills and knowledge to solve some practical and actual PLC examples and control projects.
a47-Analogy and Difference between components, operation, and functions of Hydraulic & Pneumatic circuits.

a48- Basics of Pneumatic logic circuits and processes and using of virtual labs for pneumatic control circuits.
a49- Basics of proportional hydraulic valves & circuits, electric input, and feed-back of a proportional solenoid.
a50- Basics and various types of Servo-hydraulic valves and circuits, electric requirements for input, feed-back signals of servo-valves, and practical applications of servo-hydraulic circuits.

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b- Intellectual Skills

On successful completion of this Diploma, the post-graduate student should be able to:
b1- Select and apply appropriate mathematical, graphical and technical methods in modelling and analysis of automatic control problems.
b2-Verify accuracy & validity of different types of virtlab programs by doing parallel engineering calculations.
b3-Searching for scientific & technical information and adopting automatic control self-E-learning capabilities.
b4- Analyze and compare the Performance and time response of different types of automatic control systems.
b5-Apply mass, thermodynamic and energy balance analysis for different mechanical power control systems.
b6-Apply the concept of software simulation of diagnostics & operation of various types of practical PLC systems.
b7-Compare between practical measurement devices, transducers & several methods for signal conditioning, data acquisition, and different output displaying and processing systems.
b8- Solve numerical examples on uncertainty analysis and error propagation in measurement systems.
b9- Study, describe, and compare between different methods for measurement of pressure, temperature, flow rate, flow velocity, and force ...etc.
b10- Apply and use Laplace Transform and inverse Laplace tables for mathematical modeling, block diagram reduction and for solving the system's ordinary time-dependent differential equations.

c- Professional and Practical Skills:

On successful completion of this Diploma, the post-graduate student should be able to:
c1- Identify several types automatic control problems of mech. power systems & energy transfer processes.
c2- Perform professional designs for different Hydraulics, Pneumatics, PLC, and conventional control systems.
c3- Use, apply and calibrate different types of automatic control virtual labs.
c4- Diagnose failure and problems of automatic control of mechanical power systems and equipments.
c5- Monitor & evaluate performance of different Hydraulics, Pneumatics, PLC, and conventional control systems.
c6- Formulate and analyze heat transfer and fluid flow practical problem related to control fields.
c7- Design and Analyse different types of heat exchangers and Optimize thermal and energy systems.
c8- Assess the performance & Compare the technical specifications of different types of Hydraulics, Pneumatics, PLC, and conventional control systems.
c9- Analyse the different project requirements and output components and the technical project report.
c10- Suggest possible alternative solutions for various types of automatic control problems.

d- General and Transferable Skills:

On successful completion of this Diploma, the post-graduate student should be able to:
d1- Perform engineering calculations, Draw control circuits, block diagrams, and hydraulic/pneumatic layouts.
d2- Transfer knowledge, Work in group, and Communicate in written & oral forms, both in Arabic & English.
d3- Use IT & evolutionary technological tools, and computer applications (Excel, Mat lab, Virtual labs, .etc).
d4- Prepare and write reports, Manipulate and sort data, Think logically, and do continuous self-E-learning.
d5- Use computer software applications (Excel, EES, Mat lab, AutoCAD,…etc).
d6- Identify practical problems, compare and select between different technologies for control systems.
d7- Organise and manage time and resources effectively; for short-term and longer-term commitments.

6- *Academic Reference Standards:*

The academic standards of the program are designed and adapted to satisfy the criteria presented in NARS (as given in Appendix-2).

- External References for Standards (Benchmarks)

1- Egyptian Supreme Council for Higher Education.
2- Egyptian National Academic Reference Standards (NARS.)
3- Egyptian Engineers Syndicate.

- Comparison of Provision to External References

7- *Curriculum Structure and Contents:*

This a special credit hours system Diploma under the supervision of ACC lab. The registration is done 1st at ACC lab at Mechanical Engineering Department. As per the last 2013/2014 Post-Graduate Bylaws of FECU, the Program consists of 30 credit hours of post-graduate courses of the Code MEP 5. The 30 credit hours are divided on 10 courses (each course is equivalent to 3 credit hours). The student has to study 18 credit hours of mandatory courses and 12 credit hours of elective courses. The mandatory courses must include a 3 credit hours for the Diploma Design project MEP599.**

8- *Program Structure & Organization of Courses:* (as per 2013/2014 Post-GraduateBylaws of FECU)

The Mandatory Courses: (18 credit hours)

Code	Course Title	Credit Hrs	Prerequisite
MEP 560	Instrumentation for Measurements, Tests &Control in Mech. Power Systems–1st Term	3	
MEP 561	Automatic Control–Theory and Applications in Mechanical Power Systems – 1st Term	3	
MEP 562	Using Hydraulic Circuits in Mechanical Power Systems – 1st Term in the diploma	3	
MEP 563	Using Virtual Labs for Analysis of Automatic Control Systems- 2nd Term in diploma	3	
MEP 564	Using PLC and IT in Automatic Control Systems - 2nd Term in the diploma	3	MEP 560
MEP 599	Project**- in the last Term of the diploma	3	

**** Special applied course (with no final term exam), all grades are based on the In-term works.**

The Elective Courses: (student selects 12 credit hours from the list as per the courses offered by the department in each term- subject to availability):

Code	Course Title	Credit Hrs	Prerequisit
MEP565	Using Pneumatic Circuits in Automatic Control Systems	3	
MEP566	Advanced Applications of Hydraulic Circuits in Automatic Control Systems	3	MEP562
MEP567	Advanced Applications of PLC in Automatic Control Systems	3	MEP564
MEP568	Advanced Applications of Pneumatic Circuits in Automatic Control Systems	3	MEP565
MEP569	Applications of Virtual Labs for Control of Steam Power Plants	3	
MEP570	Applications of Virtual Labs for Control of Refrigeration & Freezing Plants	3	
MEP571	Applications of Virtual Labs for Control of Central Air-Conditioning Systems	3	
MEP572	Applications of Virtual Labs for Control of Industrial Diesel Plants	3	
MEP573	Applications of Virtual Labs for Study and Analysis of Performance of ICEs	3	
MEP574	Applications of Virtual Labs for Control of Pumping Plants and Tanks Filling	3	
MEP575	Applications of Virtual Labs for Control of Solar Energy Heating Plants	3	
MEP576	Applications of Virtual Labs for Control of Central Water Heating Plants	3	
MEP577	Applications of Virtual Labs for Control of Gas Turbines Plants	3	
MEP578	Applicationsof IndustrialValves:Types,Design,Construction, Installation, & Maintenance	3	
MEP579	ApplicationsofIndustrialPipe lines:Types,Design,Construction,Installation&Maintenance	3	
MEP580	Selected Topics in Pipe lines, Pumps, and Turbines	3	*
MEP581	Selected Topics in Control Systems of Pipe lines, Pumps, and Turbines	3	*
MEP582	Selected Topics in Refrigeration and Air-Conditioning Engineering	3	*

MEP583	Selected Topics in Control of Refrigeration and Air-Conditioning Systems.	3	*
MEP584	Selected Topics in Combustion Systems and Internal Combustion Engines.	3	*
MEP585	Selected Topics in Control of Combustion Systems & Internal Combustion Engines.	3	*
MEP586	Selected Topics in Power Plants and Steam Engineering	3	*
MEP587	Selected Topics in Control Systems in Power Plants and Steam Engineering	3	*
MEP588	Fluid Dynamics and Applications		
MEP589	Theory of Turbo Machines		
MEP590	Heat and Mass Transfer		

*** Before each term, the department announces the contents and subjects covered in each selected topics course which is available for registration for that term.**

9- *Admission Requirements for the program:*

This is done as per the relevant items for general admission requirements in last 2013/2014 Post-Graduate Bylaws of FECU.

10- *Attendance, Progression and Program Completion Requirements:*

This is done as per the relevant items for general admission requirements in last 2013/2014 Post-Graduate Bylaws of FECU.

11- *Student Assessment (Methods and rules for student assessment)*

This is partially done as per the relevant items for general admission requirements in last 2013/2014 Post-GraduateBylaws of FECU. In addition, next table is also used as a guide:

Method (tool)	Assessed ILO's
1- Written exam	1, 2 & 3
2- Quizzes and reports	1, 2 & 3
3- Oral exams	1, 2 , 3
4- Practical	1 & 2
5- Project applied on a practical field problem	1, 2, 3 &4

12- *Evaluation of Program Intended Learning Outcomes:*

No documented samples are available at the time being

Evaluator	Tool	Sample
1- Senior students	Questionnaire & Verbal	N/A
2- Alumni	Questionnaire & Verbal	N/A
3- Stakeholders (Employers)	Report & Verbal	N/A
4-External Evaluator(s) (External Examiner(s))	Report & Verbal	N/A
5- Other social parties	Non	N/A

Signature of Head of the Department: Prof. Dr Ashraf Sabery

Signature of Program Director & Coordinator: Assoc. Prof. Dr. Mohsen S.Soliman

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أ.م/ محسن سيد سليمان
مديرمعمل التحكم ACC ومسئول إدارة الدبلوم
رئيس مجموعة الموائع ورئيس وحدة الجودة فى القسم

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Date: 13 /1/2015

Appendix (1)

Description of all Courses in the Program

MEP 560 - Instrumentations for Measurements, Tests and Control in Mechanical Power Systems:
Basic definitions – Concept of Calibration, static and dynamic response – Importance of accuracy, error-propagation and uncertainty analysis in experimental measurements – Methods of statistical analysis and graphical presentation of experimental results – Practical applications of measurement devices, electrical instruments, and signal conditioning devices – Using of Personal Computers in data accusation, processing and analysis during and after experimental measurements. Measurements of pressure, temperature, flow rate, fluid velocity, force. Control of Pressure, temperature, and flow rate.

MEP 561 - Automatic Control – Theory and Applications in Mechanical Power Systems:
Types of Control Systems – Mechanical components, pneumatic, hydraulic, electric systems – Modeling – Transfer function – Closed loop system – Instantaneous response – Stability and equilibrium tests – Design of control systems – Applications of control systems in turbo-machines, heat transfer equipments and in combustion systems.

MEP 562 - Using Hydraulic Circuits in Mechanical Power Systems:
Definition of Hydraulics- Hydrostatics (Pressure, Transportation & Magnification of Force & Moment)- Hydrodynamics (Continuity eqn., Bernoulli's eqn., Energy eqn., types of fluid flow)- Methods of Power transportation- Basic Components of Hydraulic Systems-Types of Positive Displacement Pumps (Gear, Vane, and piston pumps)- Types of Hydraulic Actuators (Cylinders, Engines, Semi-rotating Engines)- Pressure Valves – Directional Control Valves – Flow Control Valves- Non-return Valves – Conditioning of Hydraulic Oils (filters, Heat Exchangers, Tanks)- Oil Piping – Auxiliaries (Accumulators, Manifolds, Flow Meters, Pressure Gauges, Switches)- Hydraulic Symbols – Reading Hydraulic Schematics – Basic Hydraulic Circuits (Direction Control, Speed Control, Two-cylinders Control, Pumps Curves, Step-displacement diagram, Numbering of Hydraulic Elements).

MEP 563 - Using Virtual Labs for Analysis of Automatic Control Systems:
Definition of Virtual Labs(V.L.), Relation with PC and IT applications – Function of V. L. in Automatic Control Systems of Mechanical Power Engineering- Requirements of on line interactive Control-Systematic Basic Components and general format for Automatic Control V.L.- Main Menus of V.L. program-Setting Basic Control Elements- Showing Flow directions on Synoptic diagram- Elements of Main Control Board- Sensors and Gauges Board- Operation, Control and Alarms Board- Changing Operation Parameters- Diagnostics and Trouble Shooting- Data Recording-File Saving-Operator Reports- Charts of Heat Balance and System thermal Results- Evaluation and Calibration of V.L. Program- Case Study: Management and Operation of Automatic Control System of Industrial Steam Boiler- The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic tools, error-report filling, help/trouble-shooting menus and Thermal Balance Calculations and Plotting tools.

MEP 564 - Using PLC and IT in Automatic Control Systems:
What is a PLC- Identifying Details, functions, Applications of PLC Units- Introduction for Basic Electric Components in Automatic Control Circuits (Sensors, transducers, keys, Relays, Contactors)-Types of PLCs- Types of Analog and Digital Signals-Pneumatic Logical Elements- Types of Memories:
ROM, RAM,EPROM, EEPROM…- PLC Programming - Ladder Diagram- Function Chart- Statement List- Setting Inputs and Outputs- Timers and Counters Programming- Expanding of PLCs.

MEP 565 - Using Pneumatic Circuits in Automatic Control Systems:
Design and Analysis of Automatic Systems (Objective/Method)- Advantages and Disadvantages of Pneumatic Systems- Methods of Preparation of Compressed Air-Calculations of air piping system using

operation Parameters (length, Pressure, flow rate, Pressure-drop)- Air Pressure Ratings-Types of Actuators (Cylinders, Engines, Semi-rotating Engines)- Direct Control of Single and Double Acting Cylinder- Pressure Control Valves – Directional Control Valves – Flow Control Valves- Non-return Valves –Auxiliaries (Accumulators, Manifolds, Flow Meters, Pressure Gauges & Switches)- Symbols – Reading & Analysis of Pneumatic Circuits Schematics.

MEP 566 - Advanced Applications of Hydraulic Circuits in Automatic Control Systems:
Course Objective is to show correct method of operation of Hydraulic Systems to get their best Performance and extended operation life- Construction of Integrated Hydraulic Circuits (that include various elements studied before) to perform pre-specified functions- Applied Examples- Sealing Methods (simple and dynamic sealing)- Setting up Hydraulic Systems (1^{st} run tests, Initial required precautions, examination and starting up various elements)- Methods of operation and Maintenance: Connecting various Components- Investigation of Pump and motor status-Identifying air bleeding points in the Hydraulic System- No load Operation and Loading procedure – Adjusting Pressure & Flow Control Valves- Protective Maintenance- Trouble Shooting and Faults finding and fixing- Auxiliaries of Hydraulic Circuits(Accumulators, Manifolds, Flow Meters, Pressure Gauges & Switches).

MEP 567 - Advanced Applications of PLC in Automatic Control Systems:
Applications and Practical Examples for using PLC units in Automatic Control of Mechanical Power Systems- Various Examples and Applications for the Ladder Diagrams, Function Charts, and Statement Lists- Applications on PC using PLC simulation and Computer Programs.

MEP 568 - Advanced Applications of Pneumatic Circuits in Automatic Control Systems:
Advanced Applications on PC for Industrial Pneumatic Circuits including Virtual Labs and Interactive Simulations for Different Circuits (Q cycle, L cycle, U cycle, & the 3-cylinders cycle).These pneumatic automation cycles, are largely used in the industry (e.g., for automatic feeding of work pieces). The 4-circuits layouts are carried out with cascade & mechanical stroke end techniques. It is possible to run only single manually controlled sequence, to use every time you want to repeat cycle, or can run automatically until the deposit depletion (i.e., end of all 5-work pieces to be fed).The literal sequence has been divided in 2 or more groups, so that, the energy transmission, to the air distribution lines, is carried out by means of bi-stable 5/2 valves, driven by signals of impulsive kind (i.e., cam or mechanical actuation type). When the plant is started the air flow are visible and you can follow any selected cycle both on the pneumatic circuit and also be seen on the "stroke-pitch diagram" that characterizes the sequence. The button Exit closes the entire program and thus returns you to Windows.

MEP 569 - Applications of Virtual Labs for Control of Steam Power Plants:
Interactive Automatic Control System for Steam-Turbine & Rankin Cycle Power Generation Plant:
This is an interactive computer-based training course that includes an investigation, a virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in multi-stage industrial Steam-Turbine & Rankine Cycle Power Generation Plant of maximum electric output of 30 MWatt. Pressure and temperature gauges show various values at all critical points of the plant.The steam-turbine unit include one high-pressure part and two low-pressure parts. Steam may be extracted or not-extracted from those 3 parts for 3-feed water heat exchangers and also for a deaerating unit. The plant also includes: an industrial 120 ton/hr at 120 bar water-tube boiler (of virtLab-1) and a water-cooled vacuum condenser with 6000 m^3/hr condenser cooling-water pump and many flow control valves. The simulation includes all previous boiler controls of VirtLab-1. Additional control systems/boards are included for steam turbine and electric-alternator unit and for the vacuum condenser and the cooling-water pump. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic tools, error-report filling, help/trouble-shooting and Thermal Balance Calculations and Plotting tools.

MEP 570 - Applications of Virtual Labs for Control of Refrigeration and Freezing Plants:

Interactive Automatic Control for Industrial Refrigeration and Freezing Plant:

This is an interactive computer-based training course that includes an investigation, virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in industrial R22 compression refrigeration plant used for both freezing and cold storage of frozen products. Pressure and temperature gauges show various values at all critical points of the plant. The plant uses a 6 m^3/hr water-cooled condenser with adjustable inlet water-temperature. The reciprocating compressor runs at 1450 rpm and has a 377 cm^3 displacement volume. The plant has a freezing thermal load of 5 kW and a refrigeration thermal load of 3 kW with two adjustable thermostats for controlling refrigeration and freezing cells for different adjusted ambient temperature. On-line, and updated real R22 h-s diagram is plotted to show every point of the cycle. The h-s plotting is stored on a PDF file for further analysis. The simulation includes many flow or pressure control valves, many critical control alarms, input/output signals, operation &instrumentation parameter-boards, diagnostic tools, error-report filling, help/trouble-shooting and Thermal Balance Calculations and plotting tools.

MEP 571 - Applications of Virtual Labs for Control of Central Air-Conditioning Systems:

Interactive Automatic Control System for an Industrial Air-conditioning plant:

This is an interactive computer-based training course that includes an investigation, a virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control & real thermo-fluid processes existing in an industrial plant used to air-condition a building to some pre-specified dry-bulb temperature and relative humidity. Air-locks are used to have different adjustable ratios of recycled air brought back to the building mixed with some renewal air. The plant includes 4 centrifugal pumps for the 4 battery cells for heating, cooling, humidification, and after-heating. Each pump has its on/off control board. Each battery cell has a control board that includes a pump flow rate-meter and both inlet and outlet cell temperature (except the humidification cell). The plant has an on/off air fans or ventilators control board and air locks control board. On-line, real psychometric diagram is plotted showing all performed processes.

The diagram shows a point for Renewal air, point for Recycled air taken from inside the environment, a point for the mixture of Renewal and Recycled air, points for the air outlet from the various A/C plant batteries, and last point for the air going to the environment-building. The simulation includes many flow control valves and temperature read-out gauges. , many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic tools, error-report filling, help/trouble-shooting and Thermal Balance Calculations and Plotting tools.

MEP 572 - Applications of Virtual Labs for Control of Industrial Diesel Plants:

Interactive Automatic Control System for Industrial 6-cylinder, turbo-charger, 4 stroke Diesel engine drive with thermal balance calculations:

This is an interactive computer-based training course that includes an investigation, a virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in Industrial 6-cylinder, turbo-charger, 4-stroke Diesel engine drive. The engine follows the actual indicated compression ignition Diesel Cycle diagram. The thermal balance of this mechanical Power system is also performed and presented for each working engine condition. The engine utilizes the hot-exhaust gases to drive a compressor turbo-charger unit to pre-charge and increase the pressure of fresh air into the cycle. This unit has an air-cooler and two sea water pumps. The 6-cylinders are jacket-water cooled using a fresh water tank and two-fresh water pumps. Fuel is pumped to the injectors using two-fuel pumps.The lube oil unit is driven by two lube oil pumps & a lube oil cooler through one of the two sea-water heat exchangers. The second sea-water heat exchanger is used to cool

the fresh water used in the engine cooling circuit. Automatic control system includes both of the engine conductions section and auxiliary management section. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic page tools, error-report filling, help/trouble-shooting menus and Thermal Balance Calculations and Plotting tools.

MEP 573 - Applications of Virtual Labs for Study and Analysis of Performance of Internal Combustion Engines

Interactive Automatic Control System for an Industrial 6-cylinder, turbo-charger, Diesel engine with a hydraulic brake unit: This is interactive computer-based training course that includes investigation, a virtual computer simulation& flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in Industrial 6-cylinder, turbo-charger, and 4-stroke Diesel engine drive. The engine follows the actual indicated compression ignition Diesel Cycle diagram. The thermal balance of this mechanical Power system is also performed and presented for each working engine condition. This extension lab investigates all performance characteristics of the internal combustion engine of VirtLab-8 as a system with two degrees of freedom: during normal operation its output work is altered in two ways: (1) by changing its rpm for a fixed load on the engine shaft; (2) by changing position of hand-lever or accelerator to keep same rpm for variable load on the engine shaft. The engine characteristics are obtained at full torque load, power and fuel specific consumption. The engine is mounted on a bench and connected to a dynamometrical brake. All proper operation conditions are adjusted through the control boards. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic page tools, error-report filling, help/trouble-shooting menus and Thermal Balance Calculations and Plotting tools.

MEP 574 - Applications of Virtual Labs for Control of Pumping Plants and Tanks Filling:

Part I: Interactive Automatic Control System for an Industrial pumping plant with two Parallel or Series Centrifugal Pumps: This is an interactive computer-based training course that includes an investigation, a virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in Industrial pumping station. The station includes two centrifugal pumps which may work separately or work as pairs in parallel or in series. The pumps are provided with separated controls and instrumentation. Each of the two pumps can be operated independently from the other pump. The simulation allows changing all the operation conditions of each pump including the rpm, the inlet suction head, and the output discharge. This allows investigation of the H-Q curves of the plant for all possible different flow conditions. Also the characteristic H-Q curve of each pump can be obtained at full load conditions. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic page tools, error-report filling, help/trouble-shooting menus and Thermal Balance Calculations and Plotting tools.

Part II: important concepts of practical automatic control and real fluid processes existing in filling different vertical tanks with liquids. The plant includes a venture-meter at output and flow control valve at inlet. The simulation allows adjusting flow/speed values, working data, and venture meter values. The tank filling time is calculated and the diagram of head-pressure is plotted, presented and updated instantaneously. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic page tools, error-report filling, help/trouble-shooting menus and Thermal Balance Calculations and Plotting tools.

MEP 575 - Applications of Virtual Labs for Control of Solar Energy Heating Plants:

Interactive Automatic Control System for an Industrial Solar Heating Plant with 2-Flat Plate collectors and auxiliary boiler: This is an interactive computer-based training course that includes an investigation, a virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real

thermo-fluid processes existing in an Industrial Solar Heating Plant with 2-Flat Plate collectors and an auxiliary boiler. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic tools, error-report filling, help/trouble-shooting menus & Thermal Balance Calculations & Plotting tools.

MEP 576 - Applications of Virtual Labs for Control of Central Water Heating Plants:

Interactive Automatic Control System for a civil heating plant for hot water distribution:

This is an interactive computer-based training course that includes an investigation, a virtual computer simulation and flow visualization. The course is designed to give the participant a broad based understanding of the most important concepts of practical automatic control and real thermo-fluid processes existing in a civil heating plant for hot water distribution. The simulation includes many critical control alarms, input/output signals, operation and instrumentation parameter-boards, diagnostic tools, error-report filling, help/trouble-shooting menus and Thermal Balance Calculations and Plotting tools.

MEP 577 - Applications of Virtual Labs for Control of Gas Turbines Plants:

Interactive Automatic Control System for Gas Turbine Plants:

This is interactive computer-based training course that includes the following items: Engine Design- Operating Principles- Engine Case & Air inlet- Compressor Section- Diffuser & Combustion- Turbine & Exhaust- Ignition System- Bearing & Seals- Lubrication & Lube Oil- Lube Oil Pumps- Lube Oil Filters & Coolers- Lube Oil Instrumentation- Hydraulic Oil System- Trip Oil System- Fuel System – Fuel Gas Supply System- Fuel Gas Control System- Liquid Fuel System- Liquid Fuel system Operation- Pneumatic Starting System- Hydraulic Starting System- Diesel Starting System- Enclosures- Fire Detection- Gas Detection-Fire Extinguisher Systems- Principles of Power Generation- Generator Components- Generator Lube Oil- Generator Control- Principles of Compression- Compressor Components- Compressor Lube Oil- Compressor Control System.

MEP 578 - Applications of Industrial Valves: Types, Design, Construction, Installing, and Maintenance

Course Program &Contents: Introduction+ movie (all types of valves, basic functions, selection)- Fundamentals (hydraulic considerations, construction, Classes or ratings, materials, standards for valves, standards for different parts)- Fluid Flow in valves (calculation of pressure losses, design & sizing parameters, cavitations, fluid-tightness, solved example on sizing) - Operation of Manual Valves (types, selection, connections, operation) -Non-manual Valves: Check Valves (types, selection, design and installation factors, examples) + a movie- Control Valves: Pressure Relief Valves (direct acting, characteristics) –Automatic & Electric Valves (spool types, single/multi-stage controls)- Problems of Valves & valve Maintenance (some movies)- Water Hammer -Special Types of valves (in Hydraulic or Pneumatics Circuits).

MEP 579-Applications of Industrial Pipe lines: Types, Design, Construction, Installing, and Maintenance

Course Program &Contents: (1) *Introduction & Basic Concepts:* -Fundamental Aspects of Fluid Flow Piping Systems, Types and components of Piping Systems, Review of Hydraulic considerations, Major and Minor Losses in Piping Systems, Types of Pipe Fittings, Solved Examples. (2) *Piping System Design & Calculations*: Solved Practical Cases. (3)*Using Computer Software in the design of piping systems*. (4) *Types of Valves* (basic functions, selections: hydraulic considerations, construction, ratings, materials, Flow through valves, pressure losses, design facts / parameters - Manual Valves (types, selection, connections, operation) - Check Valves (types, selection, design and installation factors)-Reducing and Pressure Relief Valves (direct acting, characteristics) - Automatic Control Valves (spool types, single/multi-stage controls)- Valve Maintenance -Examples for automatic Valves & movies. (5) *Types of Flow Meters.*

MEP 580- Selected Topics in Pipe Lines, Pumps, and Turbines:
Special Course: Selected and Advanced Topics Covering Latest Scientific and the most Recent Technical Methods in Applications of Mechanical Power Engineering Regarding Pipe Lines, Pumps, and Turbines.

MEP 581- Selected Topics in Control Systems for Pipe Lines, Pumps, and Turbines:
Special Course: Selected and Advanced Topics in Automatic Control Covering Latest Scientific and the most Recent Technical Methods in Control Applications of Mechanical Power Engineering Regarding Pipe Lines, Pumps, and Turbines.

MEP 582- Selected Topics in Refrigeration and Air Conditioning Engineering:
Special Course: Selected and Advanced Topics Covering Latest Scientific and the most Recent Technical Methods in Applications of Mechanical Power Regarding Refrigeration and Air Conditioning Engineering.

MEP 583- Selected Topics in Control of Refrigeration and Air Conditioning Systems:
Special Course: Selected and Advanced Topics in Automatic Control Covering Latest Scientific and the most Recent Technical Methods in Control Applications of Mechanical Power Regarding Refrigeration and Air Conditioning Engineering.

MEP 584- Selected Topics in Combustion Systems and Internal Combustion Engines:
Special Course: Selected and Advanced Topics Covering Latest Scientific and most Recent Technical Methods in Applications of Mechanical Power Regarding Combustion Systems and Internal Combustion Engines.

MEP 585- Selected Topics in Control of Combustion Systems and Internal Combustion Engines:
Special Course: Selected and Advanced Topics in Automatic Control Covering Latest Scientific and most Recent Technical Methods in Control Applications of Mechanical Power Regarding Combustion Systems and Internal Combustion Engines.

MEP 586- Selected Topics in Power Plants and Steam Engineering:
Special Course: Selected and Advanced Topics Covering Latest Scientific and most Recent Technical Methods in Applications of Mechanical Power Regarding Power Plants and Steam Engineering.

MEP 587- Selected Topics in Control Systems for Power Plants and Steam Engineering:
Special Course: Selected and Advanced Topics in Automatic Control Covering Latest Scientific and the most Recent Technical Methods in Control Applications of Mechanical Power Regarding Power Plants and Steam Engineering.

MEP 588 - Fluid Dynamics and Applications:
The governing equations of fluid flow – 1-D incompressible and compressible flows with applications- 2-D flow: Newtonian fluids, Navier-Stokes equations, examples on flow in pipes. Viscous flow and theory of lubrication- Boundary Layer flow – Turbulent flow – Applications on flow of gases and liquids in pipelines.

MEP 589 - Theory of Turbo-machines:
The fundamentals, basic concepts and basic laws of turbo-machines – Similarity of turbo-machines –1-D flow –2-D flow through group of blades-cascade – 3-D flow in turbo-machines.

MEP 590 - Heat and Mass Transfer:
Heat transfer by conduction – Heat transfer by convection – Heat transfer by radiation – Heat transfer during conditions of Boiling and Condensation - Heat exchangers – Mass Transfer.

MEP 599 – Project:
Special applied course (with no final term exam), all grades are based on the In-term works.

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Appendix (2)

Program Academic Reference Standards (Same as NARS)

تتوافق كافة المعايير الأكاديمية للدبلوم مع المواصفات القياسية القومية المرجعية NARS كما يلى

Attributes of program graduates as per NAQAAE and NARS Requirements for Diploma programs:

1. **Apply the acquired knowledge in his/her profession.**
2. **Identify professional problems and propose appropriate solutions for their problems.**
3. **Master professional skills and use the most appropriate technological tools in professional practice for improving teaching process.**
4. **Communicate and lead teams through systemic professional work.**
5. **Make decisions in the light of available information.**
6. **Utilize available resources efficiency.**
7. **Display awareness of his/her role in community development and environmental conservation.**
8. **Act in a way that reflects his/her commitment to integrity and credibility, and accept accountability and taking responsibility for his/her action.**
9. **Realize of the need to develop him/hers self and engage in continuous education.**

المعايير القياسية العامة لبرامج الدراسات العليا

أولا :برامج دبلومه الدراسات العليا

١ – مواصفات الخريج

خريج برنامج دبلومه الدراسات العليا في أي تخصص يجب أن يكون قادرا على:

١. تطبيق المعارف المتخصصة التي اكتسبها في ممارسته المهنية
٢. تحديد المشكلات المهنية و اقتراح حلولا لها
٣. إتقان المهارات المهنية واستخدام الوسائل التكنولوجية المناسبة في ممارسته المهنية
٤. التواصل و قيادة فرق العمل من خلال العمل المهني المنظومي
٥. اتخاذ القرار في ضوء المعلومات المتاحة
٦. توظيف الموارد المتاحة بكفاءة
٧. الوعي بدوره في تنمية المجتمع و الحفاظ على البيئة
٨. التصرف بما يعكس الالتزام بالنزاهة و المصداقية و قواعد المهنة و تقبل المسائلة و المحاسبة
٩. إدراك ضرورة تنمية ذاته و الانخراط في التعلم المستمر

Translated ILOs NARS Guidelines For Diploma Programs

Diploma ILOs **a- Knowledge and Understanding** By the completion of the Diploma Program the graduate will be capable of:	**المعايير القياسية العامة برنامج الدبلومة** **1.2 المعرفة و الفهم** **بانتهاء دراسة برنامج دبلومه الد ا رسات العليا يجب أن يكون الخريج قاد ر على فهم واستيعاب كل من:**
a1- Understand theories and fundamentals of area of specialization and other fields related to professional practice a2- Ethical and legal principles of professional practice in field of specialization a3- Identify principle of quality assurance of professional practice in field of specialization a4- understand impact of professional practice on the environment and work on preservation and maintenance of the environment	أ -النظريات والأساسيات والمعارف المتخصصة في مجال التعلم وكذا العلوم ذات العلاقة بممارسته المهنية ب - المبادئ الأخلاقية و القانونية للممارسة المهنية في مجال التخصص ج - مبادئ و أساسيات الجودة في الممارسة المهنية في مجال التخصص د - تأثير لممارسة المهنية على البيئة و العمل علي الحفاظ علي البيئة وصيانتها

b- Intellectual Skills By the completion of the Diploma Program the graduate will be capable of:	**2.2 المهارات الذهنية** **بانتهاء دراسة برنامج الدبلومة يجب ان يكون الخريج قادر على:**
b1-Able to identify, analyze and prioritize problems in the field of specialization b2- ability of problem solving in the field of specialization b3- capability of information analysis to topics related to field of specialization b4- capacity of risk assessment in professional practice b5- Capable of decision making in light of available information	أ تحديد - و تحليل المشاكل في مجال التخصص و ترتيبها وفقا لأولوياتها ب - حل المشاكل المتخصصة في مجال مهنته ج - القا رءة التحليلية للأبحاث و المواضيع ذات العلاقة بالتخصص د - تقييم المخاطر في الممارسات المهنية ه اتخاذ - القا ر ا رت المهنية في ضوء المعلومات المتاحة
c- Practical and Professional Skills By the completion of the Diploma Program the graduate will be capable of:	**3.2 المها رات المهنية** **بانتهاء دراسة برنامج الدبلومة يجب ان يكون الخريج قادر على:**
c1- capable of applying professional skills in field of specialization c2- capable of writing up technical reports	أ -تطبيق المها رات المهنية في مجال التخصص ب - كتابة التقارير المهنية
d- General and Transferable Skills By the completion of the Diploma Program the graduate will be capable of:	**4.2 المها رات العامة و المنتقلة** **بانتهاء دراسة برنامج الدبلومة يجب أن يكون الخريج قادر على:**
d1- Effective communication in all its forms d2- employment of information technology to benefit professional practice d3- self assessment and ability to identify learning deficiencies and learning needs d4- Use of different sources to acquire knowledge and information d5- capable of team work and time management d6- capable of team leadership in different professional contexts d7- capable of continuing self-learning	أ -التواصل الفعال بأنواعه المختلفة ب - استخدام تكنولوجيا المعلومات بما يخدم تطوير الممارسة المهنية ج - التقييم الذاتي و تحديد احتياجاته التعلميه الشخصية د - استخدام المصادر المختلفة للحصول على المعلومات و المعارف ه - العمل في فريق وادارة الوقت و - قيادة فريق في سياقات مهنية مألوفة ز - التعلم الذاتي و المستمر

Appendix (3): External Evaluators Reports (to be completed ASAP)

تقرير مراجع داخلى

يعبر التقرير التالي على الراي العلمي الموضوعي للسيد/ أ.د. هبة الله مصطفى مراد
الوظيفة الحالية:أستاذ بقسم للإلكترونيات والآتصالات الكهربية بهندسة القاهرة
تمت مراجعة وتقييم توصيف البرنامج المرفق بناء على طلب: قسم هندسة القوى الميكانيكية- كلية الهندسة جامعة القاهرة
اسم البرنامج: برنامج دبلوم تطبيقات التحكم الأوتوماتيكى
تاريخ المراجعة: مارس 2015

أ) البيانات الاساسية للبرنامج:

العناصر	مستوفي	غير مستوفي
البيانات الاساسية.	√	
اسم المنسق.	√	

تعليقات المقيم:
البيانات الأساسية موجودة ولكنها غير مجمعة فى مكان واحد (عدد الطلبة – عدد أعضاء هيئة التدريس المشاركين فى التدريس – العدد الكلى للمقررات)

ب) التقييم الاكاديمي:

اهداف البرنامج:		
صياغة الاهداف	واضحة ■	غير واضحة □
قابلة للقياس	كمي ■	نوعي □

مخرجات التعلم المستهدفة للبرنامج:		
مخرجات التعلم المستهدفة	واضحة ■	غير واضحة □
ارتباط مخرجات التعلم المستهدفة باهداف البرنامج	مرتبطة ■	غير مرتبطة □
تحقق مخرجات التعلم المستهدفة بالمقررات	تتحقق ■	لا تتحقق □
مخرجات التعلم المستهدفة تتوافق مع مواصفات الخريج للبرنامج في كل من:		
- المجال المعرفي	يتوافق ■	لا يتوافق □
- المهارات التطبيقية والمهنية	يتوافق ■	لا يتوافق □
- المهارات الذهنية	يتوافق ■	لا يتوافق □
- المهارات العامة	يتوافق ■	لا يتوافق □
مخرجات التعلم المستهدفة للبرنامج تواكب التطور العلمي في مجال لتخصص	تواكب ■	لا تواكب □

تعليقات المقيم:
- علاقة كل مخرج من مخرجات التعلم المستهدفة فى كل مقرر بمخرجات التعلم المستهدفة للبرنامج غير محددة

المعايير الاكاديمية:		
تحديد المعايير الاكاديمية	محددة ■	غير محددة □
ملائمة المعايير الاكاديمية لمواصفات الخريج	ملائمة ■	غير ملائمة □
غطى توصيف البرنامج المعايير الأكاديمية المتبناة	تغطي ■	لا تغطي □

هيكل البرنامج ومحتوياته

- تعليقات المقيم: موجودة بالتفصيل فى توصيف وتقرير المقرر

جـ) تقويم اعمال الطلاب:

ملائمة الطرق المستخدمة في التقويم لطبيعة مخرجات التعلم المستهدفة | ملائمة ■ | غير ملائمة □

تعليقات المقيم:

الطرق المستخدمة في التقويم متنوعة وملائمة لقياس مخرجات التعلم المستهدفة

د- مقررات البرامج:

كود المقرر	وضوح اهداف المقرر	ارتباط اهداف المقرر باهداف البرنامج	قابلية مخرجات التعلم المستهدفة للقياس	ملائمة مخرجات التعلم المستهدفة لاهداف المقرر	ملائمة طرق التعليم والتعلم المستخدمة لتحقيق مخرجات التعلم المستهدفة	الوسائل المستخدمة للتعليم والتعلم مناسبة للطرق المذكورة	طرق تقييم الطلاب المستخدمة ملائمة	المراجع المذكورة حديثة	ملاحظات
MEP 560	√	√	√	√	√	√	√	√	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 561	√	√	√	√	√	√	√	√	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 562	√	√	√	√	√	√	√	لا يوجد	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 563	√	√	√	√	√	√	√	لا يوجد	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP564	√	√	√	√	√	√	√	√	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 565	√	√	√	√	√	√	√	لا يوجد	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة تقرير المقرر غير موجود
MEP 566	√	√	√	√	√	√	√	لا يوجد	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة تقرير المقرر غير موجود
MEP 567	√	√	√	√	√	√	√	√	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 571	√	√	√	√	√	√	√	√	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 579	√	√	√	√	√	√	√	√	-تاريخ إصدار بعض المراجع غير محددة عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP 590	√	√	√	√	√	√	√	√	عدد الساعات المخصصة لكل موضوع من محتويات المقرر غير محددة
MEP599	√	√	√	√	√	√	√	لا يوجد	لم يتم ذكر المحتويات والمراجع لإختلافه باختلاف المشروع

تعليقات اخرى:

- يوجد منسق واحد فقط لكافة مقررات البرنامج

اسم المراجع الداخلى **التوقيع**

هبة الله مصطفى مراد

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Appendix (4) Program Matrix and Curriculum Mapping

Subject Areas to Achieve the Program ILO's are:

(a) Automatic Control Theory, Modeling and Dynamic analysis of Systems, and Analysis of Conventional Controllers (e.g., PID type).
(b) Instrumentation and Measurements for Automatic Control Systems
(c) Advanced Virtual Labs applications in Mechanical Power Engineering Systems.
(d) Basic and Advanced Automatic Control Hydraulic Systems.
(e) Basic and Advanced Automatic Control Pneumatic Systems.
(f) Programmable Logic Controllers and Micro-Controller Systems (PLC's).
(g) Energy Transfer and Energy Rationalization and control processes in HVAC.
(h) Design, operation and control of Pipe-line Networks.
(i) Design, operation and control of Industrial Valves
(j) Heat and Mass Transfer Processes in Mechanical Power Systems
(k) Advanced Control Applications in various types of Mechanical Power Systems.
(l) Applied Fluid Dynamics and Turbo-machines.
(m) Energy Efficiency and Environment
(n) Project Work: various types of soft-Skills related to self-learning and short-term project management skills.

The following table (1) give the contribution of individual courses to above Subject Areas to Achieve the Program ILO's. This table was developed by the program coordinator and professional staff members. The mapping matrix shows that the program courses present balanced contribution to the Mechanical Power Engineering Diploma program ILO's.

Table (1)

Code	Course Title	Subject Areas to Achieve Program ILO's												
	Compulsory courses	a	b	c	d	e	f	g	h	i	j	k	l	m	n
MEP560	Instrumentation for Measurements, Tests and Control in Mech. Power Systems	X	X												
MEP561	Automatic Control–Theory and Applications in Mechanical Power Systems	X	X									X			
MEP562	Using Hydraulic Circuits in Mechanical Power		X		X										
MEP563	Using Virtual Labs for Analysis of Automatic Control Systems			X							X			X	
MEP564	Using PLC and IT in Automatic Control Systems		X				X								
MEP599	Project			X			X	X	X		X	X	X	X	X
	Elective Courses														
MEP565	Using Pneumatic Circuits in Automatic Control Systems		X			X									
MEP566	Advanced Applications of Hydraulic Circuits in Automatic Control Systems	X	X	X	X	X									
MEP567	Advanced Applications of PLC in Automatic Control Systems	X	X		X	X	X								
MEP568	Advanced Applications of Pneumatic Circuits in Automatic Control Systems	X	X	X	X	X									
MEP569	Applications of Virtual Labs for Control of Steam Power Plants	X	X	X							X	X		X	
MEP570	Applications of Virtual Labs for Control of Refrigeration & Freezing Plants	X	X	X							X	X		X	
MEP571	Applications of Virt. Labs for Control of Central Air-Conditioning Systems	X	X	X					X		X	X		X	
MEP572	Applications of Virtual Labs for Control of Industrial Diesel Plants	X	X	X							X	X		X	
MEP573	Applications of Virt. Labs for Study and Analysis of Performance of ICEs	X	X	X							X	X		X	
MEP574	Applications of Virt. Labs for Control of Pumping Plants and Tanks Filling	X	X	X							X	X	X		
MEP575	Applications of Virtual Labs for Control of Solar Energy Heating Plants	X	X	X							X	X		X	
MEP576	Applications of Virtual Labs for Control of Central Water Heating Plants	X	X	X							X	X		X	
MEP577	Applications of Virtual Labs for Control of Gas Turbines Plants	X	X	X							X	X		X	
MEP578	Applications of Industrial Valves: Types, Construction and Installation	X	X							X					
MEP579	Applications of Industrial Pipe lines: Types, Design, Construction &Installation	X	X						X	X					
MEP580	Selected Topics in Pipe lines, Pumps, and Turbines	X	X						X	X			X	X	
MEP581	Selected Topics in Control Systems of Pipe lines, Pumps, and Turbines	X	X						X	X		X	X		
MEP582	Selected Topics in Refrigeration and Air-Conditioning Engineering	X	X										X	X	
MEP583	Selected Topics in Control of Refrigeration and Air-Conditioning Systems.	X	X					X					X	X	
MEP584	Selected Topics in Combustion Systems and Internal Combustion Engines.	X	X							X			X	X	
MEP585	Selected Topics in Control of Combustion Systems & Internal Combustion Engine	X	X							X		X	X	X	
MEP586	Selected Topics in Power Plants and Steam Engineering	X	X							X		X	X	X	
MEP587	Selected Topics in Control Systems in Power Plants and Steam Engineering	X	X							X		X	X	X	
MEP588	Fluid Dynamics and Applications	X	X							X		X	X	X	
MEP589	Theory of Turbo Machines	X	X							X		X	X	X	
MEP590	Heat and Mass Transfer									X	X	X	X	X	

Appendix (5)
Contribution of Individual Courses to ILO's

The following table (2) give the contribution of individual courses to each of **the Program ILO's** as given in Sec.(5) of the program specifications above. This table was developed by the program coordinator and professional staff members. This table shows that the program courses present balanced contribution to the Mechanical Power Engineering Diploma program ILO's.

Table (2)

Code	Course Title	Program ILO's Covered (By No.)-see the ILO's in sec.(5) above
	Compulsory courses	
MEP560	Instrumentation for Measurements, Tests & Control in Mech. Power Systems	a7-a14, b4, b7-b9, c1,c5, c8,c10, d1-d6
MEP561	Automatic Control–Theory and Applications in Mechanical Power Systems	a1-a6,b1,b3-b5,b10,c1,c2,c4-c10,d1-d6
MEP562	Using Hydraulic Circuits in Mechanical Power	a15-a19,b3, b9, c1-c10, d1-d7
MEP563	Using Virtual Labs for Analysis of Automatic Control Systems	a20-a22, b2, b3, b9, c1-c10, d1-d7
MEP564	Using PLC and IT in Automatic Control Systems	a23-a26, b1, b3, b6, c1-c10, d1-d7
MEP599	Project	a27-a29, b1, b2, b3, b5, c1-c10, d1-d7
	Elective Courses	
MEP565	Using Pneumatic Circuits in Automatic Control Systems	a47,a48, b1-b3, c1-c10, d1-d7
MEP566	Advanced Applications of Hydraulic Circuits in Automatic Control Systems	a47-a50, b2, b3, b9, c1-c10, d1-d7
MEP567	Advanced Applications of PLC in Automatic Control Systems	a44-a46, b3, b6, b9, c1-c10, d1-d7
MEP568	Advanced Applications of Pneumatic Circuits in Automatic Control Systems	a48, b2, b3, c1-c10, d1-d7
MEP569	Applications of Virtual Labs for Control of Steam Power Plants	a21,a22,b2,b3,b5,b7,b9, c1-c10, d1-d7
MEP570	Applications of Virtual Labs for Control of Refrigeration & Freezing Plants	a21,a22,b2,b3,b5,b7,b9, c1-c10, d1-d7
MEP571	Applications of Virtual Labs for Control of Central Air-Conditioning Systems	a30-a33,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP572	Applications of Virtual Labs for Control of Industrial Diesel Plants	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP573	Applications of Virtual Labs for Study and Analysis of Performance of ICEs	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP574	Applications of Virtual Labs for Control of Pumping Plants and Tanks Filling	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP575	Applications of Virtual Labs for Control of Solar Energy Heating Plants	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP576	Applications of Virtual Labs for Control of Central Water Heating Plants	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP577	Applications of Virtual Labs for Control of Gas Turbines Plants	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP578	Applications of Industrial Valves: Types, Construction and Installation	a21,a22,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP579	Applications of Industrial Pipe lines: Types, Design, Construction & Installation	a39-a43, b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP580	Selected Topics in Pipe lines, Pumps, and Turbines	a39-a43, b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP581	Selected Topics in Control Systems of Pipe lines, Pumps, and Turbines	a1-a6,a39-a43,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP582	Selected Topics in Refrigeration and Air-Conditioning Engineering	a20-a22,a30-a33,b2,b3,b5,b7,c1-c10,d1-d7
MEP583	Selected Topics in Control of Refrigeration and Air-Conditioning Systems.	a20-a22,a30-a33,b2,b3,b5,b7,c1-c10,d1-d7
MEP584	Selected Topics in Combustion Systems and Internal Combustion Engines.	a1-a6,a7-a14,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP585	Selected Topics in Control of Combustion Systems &Internal CombustionEngines	a1-a6,a7-a14,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP586	Selected Topics in Power Plants and Steam Engineering	a1-a6,a7-a14,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP587	Selected Topics in Control Systems in Power Plants and Steam Engineering	a1-a6,a7-a14,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP588	Fluid Dynamics and Applications	a6, a14,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP589	Theory of Turbo Machines	a6, a14,b2,b3,b5,b7,b9,c1-c10,d1-d7
MEP590	Heat and Mass Transfer	a34-a38, b2,b3,b5,b7,b9,c1-c10,d1-d7

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