Cairo University
Faculty of Engineering

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Mechanical Power Engineering Department

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Part (4)

Annual Program Report of Diploma of Graduate Studies:

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

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التقرير السنوى لبرنامج 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

Part (4)

Mechanical Power Engineering Program Annual Report of Diploma of Graduate Studies:

"Applications of Automatic Control of Mechanical Power Systems"

for the year 2013/2014

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Program Report

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**

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

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

6- **External Evaluator:**

7- **Last date of program specifications approval: Faculty meeting on October 2012 (a recent program specifications approval was also taken on January 2015).**

B- Statistics:

See the Next Tables for all Grades and statistics for the last term and the one before it

جامعة القاهرة- كلية الهندسة قسم هندسة القوى الميكانيكية
نتيجة الفصل الدراسى الأول للعام الأكاديمى 2014/2015
دبلوم تطبيقات التحكم الأوتوماتيكى فى نظم القوى - طلاب تم تسجيلهم حسب اللائحة الجديدة 2015

رقم الطالب	(مكق 560) أجهزة القياس والاختبارات والتحكم فى نظم القوى الميكانيكية	(مكق 561) التحكم الأتوماتيكى - النظرية والتطبيق فى نظم القوى الميكانيكية	(مكق 562) استخدام الدوائر الهيدروليكية فى نظم التحكم الأتوماتيكى	(مكق 571) تطبيقات المعامل الافتراضية فى التحكم فى أنظمة تكييف الهواء المركزية	(مكق 590) انتقال الحرارة والكتلة	عدد الفصول الدراسية	إجمالى الساعات المكتسبة	مجموع النقاط الكلية	المعدل التراكمى	التقدير	الحالة
1	-A	A	A		+B	1	12	45	3.8	-A	مستمر
2	-B	B	+B		C	1	12	33	2.8	-B	مستمر
3	A	A	+A	+C		1	12	43	3.6	+B	مستمر
4	B	+B	-A	B		1	12	39	3.3	+B	مستمر
5	B	B	B		-B	1	12	35	2.9	-B	مستمر
6	+C	+B	-A		F	1	9	28	2.3	+C	مستمر
7	+B	-A	-A		+C	1	12	39	3.3	+B	مستمر
8	+B	+B		-B		1	9	28	3.1	B	مستمر
9	A	A	A			1	9	36	4	+A	مستمر
10	-A	-A	-A		F	1	9	33	2.8	-B	مستمر
11	-A	B	B		-B	1	12	37	3.1	B	مستمر
12	-A	-A	A	C		1	12	40	3.4	+B	مستمر
13	+B	+B	A		+C	1	12	39	3.2	B	مستمر
14	C	-B	C			1	9	20	2.2	C	مستمر
15	A	+B	A		D	1	9	37	3.1	B	مستمر
16	+C	-A	+B	B		1	12	37	3.1	B	مستمر
17	+C	-A	+A		-B	1	12	38	3.2	B	مستمر
18	A	A	+A	+B		1	12	46	3.8	-A	مستمر
19	-A	A	+B		B	1	12	42	3.5	+B	مستمر
20		-B	-A		+C	1	9	26	2.9	-B	مستمر
21	-A	A	+B	B		1	12	42	3.5	+B	مستمر

جامعة القاهرة كلية الهندسة - قسم هندسة القوى الميكانيكية
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رقم الطالب	مكق 560 أجهزة القياس والاختبارات والتحكم فى نظم القوى الميكانيكية	مكق 561 التحكم الأتوماتيكى - النظرية والتطبيق فى نظم القوى الميكانيكية	مكق 562 استخدام الدوائر الهيدروليكية فى نظم التحكم الأتوماتيكى	مكق 599 المشروع	مكق 567 تطبيقات متقدمة لتكنولوجيا PLC فى نظم التحكم الأتوماتيكى	مكق 571 تطبيقات المعامل الافتراضية فى التحكم فى أنظمة تكييف الهواء المركزية	عدد الفصول الدراسية	إجمالى الساعات المكتسبة	مجموع النقاط الكلية	المعدل التراكمى	التقدير	الحالة
1				+B	+B		3	30	92.7	3.1	B	خريج
2				-A	+B		3	30	82.2	2.7	-B	خريج
3				+B	-A		3	30	107	3.6	+B	خريج
4				+B	A		3	30	104	3.5	+B	خريج
5				A	+B		3	30	101	3.4	+B	خريج
6				A	-A		3	30	99.3	3.3	+B	خريج
7				A	-A		3	30	96.3	3.2	B	خريج
8	+B	-A	+B	-B	-A	+C	2	30	92.7	3.1	B	خريج
9	-A	A	-A	-A	-A	-B	2	30	109	3.6	+B	خريج
10	A	A	A		A	+B	2	21	81	3.9	-A	مستمر

كلية الهندسة – جامعة القاهرة - قسم هندسة القوى الميكانيكية
دبلوم تطبيقات التحكم الأوتوماتيكى فى نظم القوى الميكانيكية
نتيجة الفصل الدراسى الثانى للعام الأكاديمى 2013 /2014 (حسب اللائحة القديمة)

رقم الطالب	مكق 590 انتقال الحرارة والكتلة	مكق 579 تطبيقات خطوط الأنابيب الصناعية	مكق 566 تطبيقات متقدمة للدوائر الهيدروليكية فى نظم التحكم الأتوماتيكى	مكق 564 استخدام PLC وتكنولوجيا المعلومات فى نظم التحكم الآلى	مكق563 استخدام المعامل الافتراضية فى تحليل نظم التحكم الأتوماتيكى	عدد الفصول الدراسية	إجمالى الساعات المكتسبة	مجموع النقاط الكلية	المعدل التراكمى	التقدير	الحالة
1	C	B+	A	B	B	2	24	72.9	3	B	مستمر
2	C	B	B	B	B-	2	24	61.2	2.6	C+	مستمر
3		A-	A	A-	B+	2	24	86.1	3.6	B+	مستمر
4	----	----	----	----	----	2	12	34.2	----	----	غياب
5		A-	B+	A-	B+	2	24	81.9	3.4	B+	مستمر
6		B+	A-	B	B	2	24	78.9	3.3	B+	مستمر
7	----	----	----	----	----	2	12	39.9	---	----	غياب
8	----	A-	A	B	B	2	24	76.2	3.2	B	مستمر
9	----	B+	B+	B+	B+	2	24	73.2	3	B	مستمر
10	C+	B+	----	B+	B	1	12	35.7	3	B	مستمر
11	A-	A-	----	A-	A-	1	12	44.4	3.7	A-	مستمر
12	C	B	----	B+	B	1	12	33.9	2.8	B-	مستمر
13	----	----	----	A-	A	1	6	23.1	3.9	A-	مستمر

Commentary

The previous results show that the students learning outcomes are well satisfactory as the progression rates and the grades are more than good in most courses.

This means that a minor/small action should be taken regarding:

a) The admission level of students.
b) The teaching methods.
c) The assessment methods.

1. No. and percentage of students passing in each year/Level/Semester **average 95%**
2. No. of students completing the program and as a percentage of those who started **> 95%**
3. Grading: No. & percentage in each grade: Distinction (higher than A$^-$) ~10%, V. good (from B up to A$^-$) ~70%, good(from C up to B) ~10%, Pass (grade D in one course) ~ 1%, Weak(grade Fin one course) ~2%
4. First destinations of graduates **The Army, industrial sectors, Power-generation sectors, others**

Give percentages of the graduating cohort who have

i. Proceeded to appropriate employment

No documented records are available but upon verbal feedback, about 50 - 60% of graduates are employed in appropriate jobs.

ii Proceeded to other employment
Those who proceed to other employments choose that according to their own interest. These may sum up to about 10-20%.

iii Undertaken postgraduate study (M.Sc. or Ph. D.): N/A

C- *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.**

D- *Program Structure&Organization of Courses:*

(as per 2013/2014 Post-GraduateBylaws of FECU)

The Mandatory Courses: (18 credit hours)

Code	Course Title	C. 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	MEP560
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	C. Hrs	*Prerequisite**
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	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	3	
MEP589	Theory of Turbo Machines	3	
MEP590	Heat and Mass Transfer	3	

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

E- 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 scientific & practical problems related to automatic control of mechanical power systems.**
2. **Analyze and propose professional/technical solutions & algorithms for automatic control problems.**
3. **Analytical reading of research & report topics related to automatic control of mech. power systems.**
4. **Evaluate&estimate various risks involved in professional practice related to automatic control fields.**
5. **Take effective actions and 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 & practical skills in the fields of automatic control of mechanical power systems.**
2. **Execute short term project and write engineering technical report that involves graphs, charts, and diagrams.**
3. **Perform professional presentation&suggest possible alternative solution for automatic control problems.**
4. **Write technical requirements& 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 calculation, Draw control circuits, block diagrams & hydraulic/pneumatic layouts.**
2. **Transfer knowledge, Work in group &Communicate in written&oral forms, both in Arabic & English.**
3. **Use IT & evolutionary technological tools & computer applications (Excel, Mat lab, Virtual labs, .etc).**
4. **Prepare & 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.**

F- Academic Reference Standards:

I- External References for Standards (Benchmarks)

1- Egyptian Supreme Council for Higher Education.

2- Egyptian National Academic Reference Standards (NARS.)

3- Egyptian Engineers Syndicate.

II- Comparison of Provision **to External References**

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

G- Achievement of Program Intended Learning Outcomes (ILO'S)

- ✓ See Appendix (3): Contribution of Individual Courses to ILO's.
- ✓ All of the ILO's of the courses are achieved using lectures, discussions and tutorials. Some courses have projects and case studies in their learning methods.
- ✓ **Commentary** (quoting evaluations from some stakeholders)

- ***An established system for evaluating the outcomes of the program does not actually exist; however, oral feedback from the industrial sector is extremely considered and new topics are continuously introduced to various modules according to the needs of Industry. This takes place on individual basis.***
- ***Evaluation of students' performance through external examiners invitation takes place in the assessment of the graduation projects and commentaries mentioned are taken into account.***
- ***Accordingly, curricula upgrading is studied almost every five years in order to overcome any drawbacks in both undergraduate and postgraduate studies.***
- ***Very few students have graduated following the totally new curricula issued in 2012, then we cannot expect complete feedback from external evaluators before 2015-2016.***
- ***Oral feedback from industry indicates high knowledge, cognitive and subject-specific skills of Mechanical Power engineering post-graduates.***
- ***In contrast, the main deficiency of the post-graduates' skills lies obviously in the area of Soft-skills, experimental skills and management skills.***
- ***Overall achievement of ILOs may satisfactorily be rated as Very Good.***

H- Description and Attainment Level of Subject Knowledge, Understanding and Skills:

Subject Areas to Achieve the Program Aims:

This program aims to develop and enhance the knowledge and understanding, the scientific capabilities and intellectual Skills, the practical and professional skills and the general and transferable skills of its post-graduate student in various industrial and applied specialized automatic control fields. These fields are covered in the following areas:

(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 which are related to self-learning and short-term project management skills.

Achievement of program ILO's

Curriculum area	Having successfully completed this module the student should have knowledge and understanding, Intellectual, practical and professional skills, and general skills of:	Relevant core courses
(a) Automatic Control Theory, Modeling and Dynamic analysis of Systems, and Analysis of Conventional Controllers	**-Automatic control theory & various types and components of control systems/ loops in mech. power, electric, hydraulic, pneumatic & energy transfer systems.** **-Basic facts, definitions/terminologies and specialized and technologies used in the fields of automatic control of mechanical power systems.** **- Concepts of mathematical modelling and Transfer function of various types of mech. power systems and energy transfer processes, element and the whole system transfer functions, and Block diagram analysis.** **- Laplace Transform & inverse Laplace technique for solving system's ordinary time-dependent Diff. Eqns.** **-Solvingvariousproblemson block diagram reduction by Laplace Transform methods** **-Instantaneous dynamic response of control system and graphical presentation on an output-time scale for various types of different input testing functions.** **-Main definitions and characteristics of dynamic response of 1st and 2nd order automatic control systems.** **-Analogy between mechanical control systems and electric control systems.** **-Essential requirements of accuracy, efficiency, safety, & stability of control systems.** **-Stability and equilibrium tests for Automatic control systems.**	**MEP561** **MEP581**
(b) Instrumen-tation and Measurements for automatic Control Systems	**- Main definitions, special terminologies & technologies used in instrumentation and Measurements for automatic control systems.** **-Facts about Transducers, uncertainty, accuracy, random or biased errors, hysteresis, impedance matching...etc.** **-Importance of measurements and feed-back processes in closed-loop automatic control systems.** **-Concepts and importance of Calibration, static response/dynamic response and error-propagation in experimental measurement and control systems.** **-Uncertainty analysis, statistical calculation of experimental measurement, and graphical data presentation.** **- Solve some numerical examples on uncertainty analysis and on error propagation.** **-Various types of practical measurement transducers/sensors, types of signal conditioning devices, data acquisition hardware/software systems, and data output processing and display tools.** **-Various equations for experimental error propagation and data uncertainty and statistical analysis.** **-Different practical types of transducers and sensors used for measurement of electric signals to get pressure, temperature, flow rate, velocity, force, ...etc.** **– Using of Personal Computers in data accusation, processing and analysis during and after experimental measurements.**	**MEP560** **MEP564** **MEP578** **MEP579** **MEP580**
(c) Advanced Virtual Labs applications in Mechanical Power Engineering Systems.	**- Definition of Virtual Lab and Essential requirement/function of a general on-line interactive virtual lab to study/analyze control techniques of mechanical power systems, heat transfer equipments, and energy efficiency processes.** **-Systematic Basic Components & general format Structure of practical control virtual lab, management of control parameters, synoptic diagram, showing flow paths, instrumentation, elements of control boards, operation buttons, alarm signals, Sensors and Gauges Board and output data.** **-Main and various sub-menus of virtual lab for setting basic control elements.** **- System diagnostics and Trouble Shooting- Data Recording-File Saving-Operator Reports- Charts of Heat Balance and System thermal Results-** **- Concepts and methods for testing, verification and the calibration of automatic control virtual lab programs.** **-Application and a detailed case-study of automatic control virtual lab for an industrial water tube boiler.**	**MEP562** **MEP563** **MEP569** **MEP570** **MEP571** **MEP572** **MEP573** **MEP574** **MEP575** **MEP576** **MEP577**

(d) Basic and Advanced Automatic Control Hydraulic Systems.	**-Basics of on-line interactive virtual lab software for studying and analyzing hydraulic systems. -Basics and components of Hydraulic circuits as types of automatic control systems for linear/angular/semi-rotating mechanical outputs. -Various types of Pneumatic actuators, Pneumatic pressure valves, Pneumatic directional valves, Pneumatic flow valves, check valves, Air-conditioning methods, air conductors, and Pneumatic circuit auxiliaries. -Essential types of Pneumatic symbols used for presentation of all types of Pneumatic circuits and systems. -Concepts of reading hydraulic circuits schematics for proper analysis of the system function & its output. - Study and analyze types of basic hydraulic practical systems: clamp and drill circuit, Hi-low circuit, and a counterbalance circuit. -Study and practice design of hydraulic control systems, the Step-displacement diagram, and numbering of Hydraulic Elements. -Analogy and main Differences between components, operation, and functions of Hydraulic and Pneumatic circuits. - Basics of proportional hydraulic valves and circuits, electric input, and feed-back of a proportional solenoid. - Basics & various types of Servo-hydraulic valves and circuits, essential electric requirements for input, feed-back signals of servo-valves, and practical applications of servo-hydraulic circuits.**	**MEP562 MEP566**
(e) Basic and Advanced Automatic Control Pneumatic Systems.	**Basics of on-line interactive virt.lab for studying & analyzing Pneumatic systems. -Basics and components of Pneumatic circuits as types of automatic control systems for linear/angular/semi-rotating mechanical outputs. -Various types of positive disp. Pumps, actuators, pressure valves, directional valves, flow valves, check valves, oil conditioning methods, oil conductors, and hydraulic circuit auxiliaries. -Essential types of hydraulic symbols used for presentation of all types of hydraulic circuits and systems. -Concepts of reading hydraulic circuits schematics for proper analysis of the system function &its output. -Analogy and main Differences between components, operation, and functions of Hydraulic and Pneumatic circuits. - Basics of Pneumatic logic circuits and processes and using of virtual labs for pneumatic control circuits.**	**MEP565 MEP568**
(f) Programmable Logic Controllers and Micro-Controller Systems (PLC's).	**-Basics of process sequential control & practical applications of industrial PLC Systems. -Major functions and various components and expansion modules of different types of PLC systems. - Structure of PLC languish for ladder logic diagram, statement list diagram, and function block diagram. -Basics of programming, running, simulation, diagnostics and trouble-shooting of various PLC systems. -Advanced hardware & software components of many practical and actual PLC systems. -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. -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.**	**MEP564 MEP567**

(g) Energy Transfer and Energy Rationalization and control processes in HVAC.	**- Concepts of main HVAC processes, functions and how to do them, and their inputs or outputs signals. -Governing conservation eqns. Of the HVAC automatic control processes. -Control parameters, Synoptic diagram, flow paths, instrumentation & control boards of HVACVirtualLab. - Verification and calibration of a HVAC automatic control virtual lab program. -Identify main concepts of industrial control system by Virtual lab programs that simulate those found in practical automatic control systems -Investigate many air-conditioning HVAC control processes to understand their functions, how they work and what are their input and output signals …etc. -Study all related governing conversation equations in the Air-conditioning automatic control processes. -Verify accuracy&validity of results by performing eng. calibration for the Vlab.**	**MEP571 MEP582 MEP583**
(h) Design, operation and control of Pipe-line Networks	**-Fundamental Aspects of Pipe-Lines, Types and components of Piping Systems -Review of Hydraulic considerations, Major and Minor Losses in Piping Systems. -Types of Pipe Fittings, Piping System Design and Calculations problems. -Using Computer Software and numerical calculation methods in design & analysis of Piping systems. -Types of Valves (functions, selections: hydraulic considerations, construction, ratings, materials, Flow through valves, pressure losses, design facts/parameters-Manual Valves(types, selection, and operation). -Hydraulic and Pneumatic control valves (Pressure, Directional, check), and Types of Flow Meters.**	**MEP579 MEP580 MEP581**
(i) Design, operation and control of Industrial Valves	**-Types of Industrial Valves (functions, selections: hydraulic considerations, construction, ratings, materials, Flow through valves, pressure losses, design facts/parameters-Manual Valves (types, selection, and operation). -Hydraulic& Pneumatic control valves (Pressure, Directional, check), and Types of Flow Meters.**	**MEP578 MEP562 MEP565 MEP566 MEP568**
(j) Heat and Mass Transfer Processes in Mechanical Power Systems	**- Relation between heat transfer processes and thermodynamic processes. - Different modes of heat transfer and their physical origin. - Steady 1-D conduction, uniform and non-uniform thermal conductivity, heat sources, and extended surfaces. - Different heat transfer processes involving free and forced convection problems. - Multi-mode heat transfer problems and basic types and performance of heat exchangers. <u>Note:</u> all various additional ILO's are defined specifically as per the individual selected topics in the relevant "Selected Topics in…" Elective Courses.**	**MEP590 MEP580 MEP581 MEP582 MEP583 MEP584 MEP585 MEP586 MEP587**
(k) Advanced Control Applications in various types of Mechanical Power Systems	**- Proportional-Integral-Derivative (PID) controllers and their tuning for the control of engineering devices/systems. - Control valves and regulators. - Solving control engineering problems with Mat-lab. - Control of heat exchangers, boilers and furnaces. - Control of compressors and pumps. - Techniques for theoretical analysis of vibrating systems with up to 2 degrees of freedom, including rotating systems. - Vibration measurement and analysis methods including modal analysis. -Noise measurement & analysis methods including importance of legislation. -Techniques for Sound Pressure Level prediction. - Design guidelines to limit noise and vibration levels. <u>Note:</u> all various additional ILO's are defined specifically as per the individual selected topics in the relevant "Selected Topics in…" Elective Courses. All such topics should be selected and to be in agreement with the overall program ILO's.**	**MEP580 MEP581 MEP582 MEP583 MEP584 MEP585 MEP586 MEP587**

(l) Applied Fluid Dynamics and Turbo-machines	**- Introducing concept of water hammer & some applications in pipe network analysis. - Basic concepts and governing equations of compressible flow. - Basic principles of fluid mechanics and thermodynamics as related to turbo-machines. - Similarity analysis as related to turbo-machines. - Basic components of turbo-machine stage. - Basic principles of turbo-machines flow, 1-D, 2-D and 3-D flows. - Basic principles of design, operation, and performance of different types of turbo-machines (thermal and hydro-types).**	**MEP588 MEP589 MEP579 MEP580 MEP581**
(m) Energy Efficiency and Environment	**- Availability of different energy sources - Energy conversion technologies and efficiencies - Energy conservation methods - Economics of energy conservation - Renewable energy sources - Renewable energy technologies - Economics of renewable energy - Environmental impact of power generation - Emissions from power plants (air/water/solid waste pollution). - Pollution prevention and reduction technologies. - Advanced Environmental Pollution**	**MEP573 MEP575 MEP576 MEP577 MEP584 MEP585 MEP586 MEP587 MEP590**
(n) Project Work	**-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. - Integration of various parts of subjects, knowledge and understanding into a specific project task. - Integration of different human resources & available materials into a team project due at a specific time. -Understand the published literature on the topic of the investigation that demonstrates both what is known and the limits of current knowledge. - Limitations of the techniques of research in the fields of control of Mechanical Power Engineering. - Diploma graduates would be expected to have carried out an individual research project. These projects would develop competence in investigating, managing and applying knowledge, usually in the solution of a complex problem.**	**MEP599**

I- Achievement of Program Aims

The indicators for achieving the program aims are:

- Assessment items of each topic including coursework, student's reports and papers, and final exams.
- Quality and topics covered by the Diploma graduation project thesis/report.
- Feed-Back reports from all Students Evaluation Sheets for individual Courses ILO's and Instructors are being used recently starting from the academic year 2014/2015.

Commentary

- *The overall evaluation of the program aims' achievement may satisfactorily be rated as adequate.*
- *Worthy to mention that the present evaluation of the program aims' achievements is based, mainly on internal evaluation of department staff and some stakeholders.*
- *However, external examiners evaluate the level of gain of students from the mentioned program based on their performance during the assessment of their Diploma graduation projects.*
- *The next table evaluating the program ILO's aims' achievement is derived from many sources such as external examiners commentaries and oral feedback and some stakeholders.*

Code	Course Title	Intended Learning Outcomes(ILOs)
MEP560	Instrumentation for Measurements, Tests & Control in Mech. Power Systems	Appendix III.
MEP561	Automatic Control–Theory and Applications in Mechanical Power Systems	Appendix III.
MEP562	Using Hydraulic Circuits in Mechanical Power	Appendix III.
MEP563	Using Virtual Labs for Analysis of Automatic Control Systems	Appendix III.
MEP564	Using PLC and IT in Automatic Control Systems	Appendix III.

MEP565	**Using Pneumatic Circuits in Automatic Control Systems**	Appendix III.
MEP566	**Advanced Applications of Hydraulic Circuits in Automatic Control Systems**	Appendix III.
MEP567	**Advanced Applications of PLC in Automatic Control Systems**	Appendix III.
MEP568	**Advanced Applications of Pneumatic Circuits in Automatic Control Systems**	Appendix III.
MEP569	**Applications of Virtual Labs for Control of Steam Power Plants**	Appendix III.
MEP570	**Applications of Virtual Labs for Control of Refrigeration & Freezing Plants**	Appendix III.
MEP571	**Applications of Virt. Labs for Control of Central Air-Conditioning Systems**	Appendix III.
MEP572	**Applications of Virtual Labs for Control of Industrial Diesel Plants**	Appendix III.
MEP573	**Applications of Virt. Labs for Study and Analysis of Performance of ICEs**	Appendix III.
MEP574	**Applications of Virt. Labs for Control of Pumping Plants and Tanks Filling**	Appendix III.
MEP575	**Applications of Virtual Labs for Control of Solar Energy Heating Plants**	Appendix III.
MEP576	**Applications of Virtual Labs for Control of Central Water Heating Plants**	Appendix III.
MEP577	**Applications of Virtual Labs for Control of Gas Turbines Plants**	Appendix III.
MEP578	**Applications of Industrial Valves: Types, Design, Construction and Installation**	Appendix III.
MEP579	**Applications of Industrial Pipe lines: Types, Design, Construction& Installation**	Appendix III.
MEP580	**Selected Topics in Pipe lines, Pumps, and Turbines**	Appendix III.
MEP581	**Selected Topics in Control Systems of Pipe lines, Pumps, and Turbines**	Appendix III.
MEP582	**Selected Topics in Refrigeration and Air-Conditioning Engineering**	Appendix III.
MEP583	**Selected Topics in Control of Refrigeration and Air-Conditioning Systems.**	Appendix III.
MEP584	**Selected Topics in Combustion Systems and Internal Combustion Engines.**	Appendix III.
MEP585	**Selected Topics in Control of Combustion Systems & Internal Combustion Engines**	Appendix III.
MEP586	**Selected Topics in Power Plants and Steam Engineering**	Appendix III.
MEP587	**Selected Topics in Control Systems in Power Plants and Steam Engineering**	Appendix III.
MEP588	**Fluid Dynamics and Applications**	Appendix III.
MEP589	**Theory of Turbo Machines**	Appendix III.
MEP590	**Heat and Mass Transfer**	Appendix III.
MEP599	**Project**- in the last Term of the diploma**	Appendix III.

Commentary

It can be seen from Appendix III. that all courses contribute to at least one of the program ILOs with an ascending hierarchy from compulsory courses to elective courses, with some ILOs covered by more than one course due to their diverse nature and requirements of more than one subject.

J- Assessment Methods:

This is done as per the relevant items or faculty requirements in the 2013/2014 Post-GraduateBylaws of FECU. The adopted assessment methods include:

a. Term works (assignments, reports, papers, sheets, practical computer lab reports and Case Studies).

b. Final written exam.

For most courses 70% of the total course grades are based on the formal Final written exam, while 30% of the total course grades are based on the all term works (assignments, reports, papers, sheets, computer lab reports and case studies).

However, assessment method of the Diploma Project Course **MEP599** is:

50% of the total course grades are for a project oral presentation on a specific pre-announced date

50% of the total course grades are for a formal technical engineering project report

Commentary (quoting evaluations from some stakeholders)

- ***Due to many difficulties encountered in oral and practical evaluation exams, the most reliable and applicable assessment method is the written formal exam.***
- ***In some courses, only one staff member from the examiners committee is responsible for setting and marking the term-works as well as the final exams. The same person, may also conduct the oral exam and the semester-work, the issue which would certainly render the whole process ineffective and, sometimes, unfair. In conclusion, it is recommended to establish a system to activate the role of the examiners committee.***

K- Significant Student Achievement:

The significant achievements of the Diploma students are represented by:

Distinguished and professional varieties of Diploma Design projects. The oral presentations and the technical engineering project reports covered many different practical automatic control fields. These fields included:

- ✓ Variety of Advanced Applications of PLC in Automatic Control Systems (e.g., elevators, pipe cutting machines …etc).
- ✓ Applications of Virtual Lab for Control of Central Air-Conditioning Systems.
- ✓ Applications of design, calculation and control of Industrial Pipe line networks.

Commentary (quoting grades statistics from Section B and evaluations from some stakeholders)

- ***It may be noticed from the above* statistics *table that great percentage of student's total grades ranges from B to A- (i.e., 75% to 90%). Most of the GPAs are greater than 2.8 and up to 3.8.***
- ***A small percentage of student's grades ranges from C to B- (i.e., 62% to less than 75%).***
- ***Only one student got D grades in one course (from 50-60%)***

L- Quality of Learning Opportunities

The quality of teaching and learning is assessed through:

- Achieving program aims.
- Students evaluation reports.
- Oral comments from employers and some stakeholders.

M- Quality of Teaching and Learning

Commentary on quality of teaching &learning (quoting evaluations by stakeholders including students)

The ACC-LAB Teaching Facilities:

- ***The ACC LAB in the MEP department operates and supervises this post-graduate Diploma. The ACC LAB has its Automatic Control PC-Lab (on the 4th floor of the 17000 New Mechanical Engineering Building). Some courses of this Diploma use this PC-LAB.***
- ***This ACC PC-LAB is equipped with more than 10 modern and fast PC's, data show, motor-driven sliding white screen, and fixed white board. These PC's are equipped with various types of automatic control and virtual labs software and large number of general-use programs.***
- ***The ACC has also a 2nd experimental Automatic control LAB on the ground floor of the 17000 New Mechanical Engineering Building). Some advanced courses and the Diploma project of this Diploma use this Experimental-LAB. This LAB includes a proportional and servo-hydraulics machine, several Pneumatic facilities, some conventional PID-controllers Machines, several PLC projects, and two sets of Advanced PLC-Training kits for Operation and Programming of Industrial Process Control and PLC Systems. This educational Kit allows for reliable training on engineering processes and PLC systems as close as possible to those in industrial and actual production. The Kit allows for right "artificial" training processes that are economic, flexible and practical. In addition to Kit-hardware, the training system includes computer-aided Software, Virtual-Labs, and practical exercise methods that ensure very good expertise in automation and PLC technologies.***

The other MEP Department Teaching Facilities:

- ***There are 2 lecture halls that can accommodate about 200 students, 2 smaller halls that can accommodate 80 students and 3 rooms that can accommodate 50 students. In addition, there is one seminar room, one ICT laboratory, two rooms for administration and 18 rooms for staff members.***
- ***Some instructors recommend textbooks as subsidiary resources material for their course. They mostly rely on their own notes or books. Most of the textbooks suggested as references are available at the faculty library or as soft copy that can be used by students.***
- ***When a course relies on a textbook, it is made sure by the lecturer that such book is available at the faculty library. There is provision for students to photocopy pages of the book for their own use. A student may borrow a book provided it doesn't leave library grounds. It is not allowed, however, to borrow books out of the library.***

- *Students admitted to the Diploma program should read, write and understand English, at least as far as technical terms are concerned.*
- *Some professors use overhead projectors and others use data shows in their lectures. An estimate for the extent of the use of projectors & data shows in lectures is about 85%.*
- *The university has limited subscription to science direct, which is used by a small number of students and staff. The internet search engines are extensively used by the students for their reports and graduation projects.*
- *Department Computer Labs equipped with PC machines, word-processing and printing facilities assists students in successfully conducting their reports and graduation projects.*
- *There are 3 laboratories affiliated to the Mech. Power Engineering Department. These laboratories are equipped with many small scale as well as pilot scale units of adequate quality. The lab session is always handled by a staff member, at least one assistant and a technician, this in order to ensure maximum benefit of the practical session, as well as safety of the students. However, the labs need to be continuously upgraded to suit the work market demand.*
- *Staff members provide extra tutorials and distribute extra sheets with model answers to students according to need.*
- *The quality of learning opportunities may be rated as Adequate; however, they should be improved in order to suit the increasing number of students.*

N- Effectiveness of Student Support Systems

- **Commentary** (*on both academic and pastoral/personal support for all students*)
- *During each week of their time of study, all Diploma students receive digital and electronic files by the E-mail for all presented lectures, assignments and reports for all studied modules. In addition, they get also any reference digital-books or scientific materials such as chart/tables and engineering data-books. For some of Virtual Lab courses, all students receive free softcopy of the Virtual-Lab program used in those courses in addition to copies and notes from the programs catalog-books.*
- *Some Experimental or PC-laboratories are also available to develop the students' practical skills.*
- *The academic postgraduate advisory system helps students during their first two terms to select their elective courses based on their study theme.*
- *For completing the 10-courses requirements for graduation, all students are assigned to a Diploma project supervisor for completing the MEP599 course requirements.*
- *Faculty Library, in addition to University Library, are accessible to students five days every week all through the academic year.*
- *The ACC-Facilities in addition to the Department Computer Lab equipped with PC machines, word-processing and printing facilities assist students in successfully conducting their reports and Diploma graduation projects.*
- *Student Postgraduate-Handbook & Faculty Year Books are available for all students starting their first term of study.*
- *Extra support is offered to students through personal communication with staff members during announced office hours.*
- *Staff members provide extra tutorials and distribute extra sheets with model answers to students according to their needs.*
- *During their study, students are allowed to be trained centrally at faculty premises to use engineering software such as AUTOCAD, MATLAB,…….. etc*
- *The Graduates and Youth care are responsible for helping students to feel familiar with the atmosphere in which they exist , as well as encourage them mingle with their postgraduate colleagues and carry on as many activities as possible in order to lead a healthy and successful postgraduate university life. The Graduates and Youth care activities may be summarized as follows:*

- *Organizing a welcome celebration for the new comers.*
- *Organizing students' contribution in sports championships.*
- *Encouraging students to share in social university life.*
- *Providing financial aids for needy students.*
- *Studying the cases of needy students and offering them financial aid and recommending scholarships for them.*
- *Receiving students' complaints and helping them overcome any difficulties encountered.*

O- Learning Resources

a. No. and ratio of faculty members and their assistants to postgraduate students

Ratio of staff members to the Diploma postgraduate students is approximately: 1 : 15
(Note that this ratio may change greatly for the different types of specific elective courses)

b. Matching of faculty members specialization to program needs

Curriculum area	Staff members(Professors Emeritus/Professors/Associate Prof./Assistant Prof.)	Extent of Adequacy
Heat Transfer Group	Total of **18** staff members	**Very adequate**
FluidMechanicsgroup	Total of **16** staff members	**Very adequate**
Combustion group	Total of **19** staff members	**Very adequate**

Commentary

- *It may be noticed from the above table that the number of teaching staff in each curriculum area is very adequate to great extent. However, for the special field of Automatic Control Applications, the number of teaching staff is less than adequate*
- *The actual problem lies in the deficiency of tutorials assistants. It is recommended, to overcome this problem, to increase number of tutorials assistants.*

c. Availability and adequacy of Program Handbook

There is a handbook available for new postgraduate students of the faculty. This handbook contains the faculty mission and strategic objectives as well as the study plan and regulations for all offered postgraduate programs. It is distributed to all new students when completing their registration papers through the graduate student affairs department.

d. Adequacy of Library facilities

There are two libraries serving the department. The main library is the faculty library, which contains a large number of reference books, in addition to Journals; students are only allowed to use the references in the library or photocopy parts of them. The second library is inside the department. It contains a large number of mechanical power engineering reference books; students are allowed to borrow books from this library. Both libraries are open for both students and staff the whole week (Sunday – Thursday.)

The faculty library contains about 790 relatively new books and about 2260 old books in the Mechanical Power Engineering field. These books cover the following areas: general chemistry, Mechanical Power products, organic and inorganic technology, fluid mechanics, mass and heat transfer, physical chemistry, thermodynamics, refineries and Petro Mechanical Power industries, reactor design, pollution engineering, biotechnology, renewable energy, natural gas processing, and vessel design. Almost all the books are in English. The library contains also several old Journals, and is subscribed to about 145 online-Mechanical Power-engineering-Journals (on www.sciencedirect.com).

The department library contains about 450 reference books; all of them can be loaned. More than 95% are available in English language, the rest being in Arabic, French and German. This library doesn't contain journals.

e. Adequacy of Laboratories

In addition to the above mentioned learning resources and facilities, there are 11 laboratories affiliated to the Mechanical Power Engineering Department. These laboratories are equipped with

many small scale as well as pilot scale units of adequate quality. The available equipment is meant for under-graduate teaching as well as postgraduate and research oriented projects. Table 6 illustrates the laboratories affiliated to the department. It should be noted that some laboratory tools are needed which is currently requested by LAB-Committee staff members.

Table 6: All Laboratories affiliated to the department

Laboratory	*Year of Study*
Undergraduate Laboratories: 1- The "Heat Laboratory"	Second, Third and Fourth Years
2- The "Measurements and Calibrations Laboratory"	Third and Fourth Years
3- The "Fluid Mechanics Laboratory":	Second, Third and Fourth Years
4- The "Computers Laboratory":	Second, Third and Fourth Years
5- The "Automatic Control Laboratory"	Fourth Year
6- The department Work Shop:	All undergraduate & Postgraduate years
Postgraduate or Research Laboratories: 7- The Turbo machinery and gas dynamics lab	Postgraduate studies
8- The Hydraulic machines lab	Postgraduate studies
9- The Heat transfer lab	Postgraduate studies
10- The Combustion dynamics lab	Postgraduate studies
11- The Continuous Combustion lab	Postgraduate studies

f. Adequacy of Computer facilities:

- *As discussed before, the ACC LAB has its Automatic Control PC-Lab (on the 4th floor of the 17000 New Mechanical Engineering Building). Some courses of this Diploma use this PC-LAB. This ACC PC-LAB is equipped with more than 10 modern and fast PC's, data show, motor-driven sliding white screen, and fixed white board. These PC's are equipped with various types of automatic control and virtual labs software and large number of general-use programs.*
- *The Faculty of Engineering Central Computer Labs provides the following survives to Mechanical Power Engineering Department:*
  1. *500 PC's connected to the internet.*
  2. *Internet connection of 34 Mbps.*
  3. *Access to different engineering channels & research papers: Science Direct, JEEE, ASME, AIAA*
  4. *Software for training on: Windows, Office, Simulation Packages (Mat lab), Computer Graphics & AUTOCAD, 3D Max, Flash and Director, Microsoft Programming Environment ASP. NET.*
- *Meanwhile, there are 30 PCs available in the Mechanical Power Engineering Computer Lab for use by all students. The ratio of the department's PCs to students is 0.1. However, almost 90% of the students use their own PCs and have got permanent access to internet and information facilities. The computer labs are currently being extended to accommodate a larger number of PCs following an increase in the number of students. Most of the computers in this PC-LAB are connected to the internet. The lab is available for students Sunday to Thursday from 8:30 AM to 7:00 PM.*
- *About 90% of the staff of the program has a free access to email and the internet through their computers at the department. The ratio of PCs available for the staff to the number of staff is about 0.5. All of the staff members can use the internet. Some professors use overhead projectors and others use data shows in their lectures. An estimate for the extent of the use of projectors & data shows in lectures is about 40%. The university has limited subscription to science direct, which is used by a small number of students and staff. The internet search engines are extensively used by students for their reports and graduation projects.*

g. Adequacy of Field/practical training resources:

- *As discussed before, the ACC LAB has a 2nd experimental Automatic control LAB on the ground floor of the 17000 New Mechanical Engineering Building). Some advanced courses and the Diploma project of this Diploma use this Experimental-LAB. This LAB includes a proportional and servo-hydraulics machine, several Pneumatic facilities, some conventional PID-controllers Machines, several PLC projects, and two sets of Advanced PLC-Training kits for Operation and Programming of Industrial*

Process Control and PLC Systems. This educational Kit allows for reliable training on engineering processes and PLC systems as close as possible to those in industrial and actual production. The Kit allows for right "artificial" training processes that are economic, flexible and practical. In addition to Kit-hardware, the training system includes computer-aided Software, Virtual-Labs, and practical exercise methods that ensure very good expertise in automation and PLC technologies.

- *A system for assessment and evaluation of students' achievement in the field of practical/experimental training does not exist. No marking or grading system for the practical/experimental training is present in the study plan. The practical/experimental training description in the study plan needs reformulation in order to ensure maximum achievement.*

h. Adequacy of any other program needs: *The lecture rooms are renovated and equipped with data show and proper teaching media.*

P- Quality Management

a. Availability of regular evaluation and revision system for the program

- *A regular evaluation for ILO's and revision system for all the postgraduate programs is currently available starting from the 1st term 2014/2015.*
- *This central evaluation system is currently available only through faculty system of independent evaluation by students of instructors and ILOs achievement. There is need for assigning an external evaluator and a major stakeholder evaluator.*
- *A new revised and developed version of the 2013/2014 postgraduate curricula was recently issued on the 1st term 2014/2015.*
- *The staff when writing the postgraduate curricula of 2013/2014 have put into consideration all the weak points that have led to negative impacts on the graduates' attainment level.*
- *The evaluation of the Diploma graduation project is made by a committee that includes the main instructors and some of the faculty staff of the field.*

b. Effectiveness of the system

- *A system for measuring the effectiveness of the system has been started on 1st term 2014/2015. It is too early to judge on the effectiveness & impact of this Quality Assurance System on postgraduate programs.*
- *However oral feedback from industry is taken into account.*
- *The effectiveness of the system could be improved as mentioned in the action plan. Could be improved as mentioned in the action plan.*

c. Effectiveness of Faculty, University laws and regulations for progression and completion

- *University laws and regulations concerning the postgraduate students' achievement and results of exams do not differentiate between the nature of study and activities in every academic program. The so called "El Ra'faa" rules are put in a way that the students' grades do not reflect the actual student level. This, however, will be changed to some extent in the new curriculum to be effective on 2014/2015.*
- *These general regulations give the postgraduate student the right to repeat- for one time only - any course of grade "F" or less than grade "C" or 62% for the Diploma or less than grade "B" or 70% for the M.Sc. and Ph.D. programs to improve his GPA points. This system actually creates too many problems and overload on staff as well as administration complications in addition to the negative impacts on the academic level of these graduates.*
- *Also effective to some extent; for example, university laws are not flexible when students transfer from one college to a corresponding one in another university. Also, the ratio of the final exam to the total course grade is may be large for some courses. This, however, can be changed for some courses as per the requirements of the Department and the approval of the Faculty Council as per the new curriculum to be effective on 2014/2015*

d. Effectiveness of Program external evaluation system:

i- External evaluators

- *Not effective as there was no external evaluator for academic year 2013/2014.*
- *External evaluation is not available among the faculty regulations and it should be included. However the program has applied the external evaluation system as shown in Appendix (1).*

ii- Students

- *Applied, centrally, this year by the faculty. Needs improvement as the number of students participating in the evaluation is relatively limited. Questionnaires were done for all of students in all courses. Evaluation system started on the 1st term 2014/2015 but the students are unable to fill-in the questionnaires appropriately or decide above effectiveness due lack of awareness and loss of interest as well as loss in confidence that any corrective action may be undertaken.*

iii- Other Stakeholders

A system does not exist. Not available this year or the last 2 years due to national circumstances.

d. Faculty response to student and external evaluations

- *Various comments from staff and some stakeholders have been discussed during regular department meetings. Most of these comments have been taken into consideration when updating the 2013/2014 program bylaws and the various course specs/reports.*
- *The student evaluations reports and comments should be handed back to the department head and various instructors and they should respond in their corresponding course specs/reports.*
- *The committee responsible for improving the Quality Assurance of education in the department analyzes the student evaluations and produces a report indicating appropriate action plan to be delivered to the faculty members.*
- *Feedback of students' questionnaire should be analyzed and it is hoped that a mechanism would be initiated to activate the process and respond positively to the students' evaluation. So far, no corrective actions have been carried out in response to the students' evaluation.*

Q- Proposals for program development

a. Program structure (units/credit-hours)

Application of full credit-hours system needs full time presence of teaching staff. It is early to implement. The Units system is applied since it suits current number of Diploma students.

b. Courses, deletions and additions and modifications

- *Modifications are proposed to some courses in the 2013/2014 bylaws in order to minimize duplication between different postgraduate levels. The new proposed bylaws included a changing in the curse name and content for M.Sc. Program to eliminate similarity with the Diploma level.*
- *The new 2014/2015 bylaws included unifying the Technical Writing course for the M.Sc. & Ph.D. programs to assure consistency among all programs and assurance of relevant ILOs.*
- *Updating courses are in progress. Many modifications have been included and proposed to some courses in the new program Bylaws in order to comply with the NARS for postgraduate specifications.*

c. Staff development requirement

- *The staff development project (FLDP) implemented in Cairo University in 2003 is the only training program available for staff as well as assisting staff development.*
- *Incentives related to academic activities needed (publications – books – projects …) are suggested to encourage staff to work on developing their academic level.*
- *Training courses should be proposed to develop the skills of the faculty members.*
- *Faculty members are to be encouraged to attend relevant international conferences and to offer short presentations/reports outlining the recent trends in their area of research.*

d. Concerns/ weaknesses

The program currently shows the following points of weaknesses:

- *Due to increased number of the required elective courses, not all of the elective courses are available for all students on each term.*
- *Students who are completing their last semester(4) and who have failed a course which is not offered on such term are jeopardized. The Program offers the relevant course for exam only to solve this problem.*
- *The laboratory facilities do not meet all students' needs for Postgraduate level.*

R- Progress of Previous Year's Action Plan

Action Identified	Person Responsible	Progress of action, state if completed and any reasons for non-completion
1- Course & Schedules	N/A	
2- Human Resources	N/A	
3- Evaluations	..... N/A.....	.....

S- Action Plan

-Action Plan for the next 3 Academic Years 2014/2015 to 2017/2018

#	Actions Required	Person Responsible	Completion Date
1	**Human Resources:** **a-** Adding more staff members who can teach the Diploma very specific/practical Automatic control Courses. **b-** Adding one new Lab-engineer/technician to assist in teaching the tutorials of courses and performing the various control laboratory experiments.	The Diploma Director, the Department Chair and The Faculty Dean	-by the end of year 2015/2016
2	**Teaching Aids/Facilities:** **a**- Providing the lectures/classrooms and laboratories of the ***ACC-LAB Facilities*** of with fixed data shows, more numbers of fast PC's and other audio/visual teaching aids. **b**-Upgrading lab facilities**:** Doing maintenance and adding additional modernized automatic control equipments/training kits for the ***ACC-LAB Facilities.*** **c**-Providing all ***ACC-LAB Facility*** rooms with adequate furniture, and faster Internet-connections. **d**- Providing the ***ACC PC-LAB*** with original-updated licensed technical software packages such as MATLAB and advance control virtual-Labs to be available for staff & Diploma students. **e**- developing computer and network skills of the academic staff and also for all the administrative staff.	The Diploma Director, the Department Chair and The Faculty Dean	-by the end of year 2015/2016
3	**Teaching Facilities and Methods:** **a**- Apply the new 2014/2015 postgraduate curriculum **b**- Preparing 1st electronic versions and hard copy for all Course files, Program Specifications and Program Report of the Diploma. **c**-Increasing practical training opportunities through more agreements between the department and the industrial sectors as well as energy sectors	-The Diploma Director, the Department Chair, and the Faculty Dean, and the postgraduate faculty administration, - Staff members for each course.	By the end of the 2nd term of the 2014/2015 year
4	Revising and Updating the Bylaws and the contents of each course file (i.e., specifications/Reports)	The Diploma Director, The Department Chair, &faculty administration	By the end of the 2nd term of the 2015/2016 year
5	-Assign external evaluator for the Diploma program. -Revising and Updating the policy and procedures of assessment techniques (as approved by NARS). This requires further awareness of the policy within the department. -Revise assessment methods for each course and assure existence of variety of assessment methods.	The Diploma Director, The Department Chair, ,faculty administration, All program instructors	By the end of the 2nd term of the 2014/2015 year
6	Providing Good photocopying facilities of documents related to teaching materials that should be made available for all academic staff teaching in the Diploma.	The Diploma Director, The Department Chair, &faculty administration	- By the end of the 2nd term of the 2014/2015 year
7	Performing Maintenance of all of the ACC-LAB Facilities which includes PC-LAB, Experiment-LAB, and lecture/class rooms. Securing ACC-LAB Facilities entrances. Deploying a fire alarm system.	The Diploma Director, The Department Chair, &faculty administration	- By the end of the 2nd term of the 2017/2018 year

8	Installing a digital automatic control library in ACC-PC-LAB and updating MEP department library to include latest proceedings/ transactions of the JFM, Physics Fluids, ASME, IEEE …etc and also providing online subscription of such elite journals and new references and text books to benefit both the staff and students. An explicit and valid borrowing policy should be provided to staff and students.	The Diploma Director, The Department Chair, The Faculty Dean and the Administration	By the end of the 2nd term of the 2015/2016 year
9	Increasing the number of students filling the evaluation forms in order to obtain statistically valid results	Quality Assurance unit & Diploma Director	By End of 1st year
10	Follow up on the faculty members to respond to the students evaluation comments in the course specifications and Reports.	Quality Assurance unit & Diploma Director	By End of 1st year
11	Conducting seminars for faculty members attending international conferences to share gained experience	Department council	By End of 1st year
12	Updating and Populating the ACC-website with data such as publications, patents, research projects, etc from faculty members	All faculty members	- By End of 1st year
13	Improving the academic advising system	Education Improvement committee	By End of 1st year
14	Establish a strong link with the Alumni	Education Improvement committee	-By End of 2nd yea
15	-Assign a stakeholder representative to evaluate the program -Organize a workshop with the stakeholders	Human resources committee	By End of 1st year
16	Enhance staff engagement and participation in the process.	Quality team with Faculty Quality team who are currently studying applying motivation and other methods to enhance staff engagement.	By End of 1st year

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

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

****

أ.م/ محسن سيد سليمان

مديرمعمل التحكم ACC ومسئول إدارة الدبلوم

رئيس‌مجموعة الموائع ورئيس وحدة ضمان الجودة فى القسم

****

Date: 13 /3/2015

Appendix (1)

External Evaluator Report

الأستاذ الدكتور / رئيس قسم هندسة القوى الميكانيكية

تحيــة طيبـــة وبعـد،،،

فـي اطـار سـعي الكليـة الـي تطـوير العمليـة التعليميـة وإسـتجابة لقـرار المجلـس الأعلـى للجامعـات بشـأن ضـرورة تعيين مقيم خـارجى لكل برنـامج تعليمـى سـواء لمرحلـة البكـالوريوس أو للدراسـات العليـا بالجامعـات المصـرية ، مرفـق طيـه لسـيادتكم قائمـة بأسـماء السـادة الأسـاتذة المقيمـين الخـارجيين المقتـرحين لتقيـيم البـرامج الخاصـة بكلية الهندسة والمعتمدة من مجلس الكلية بجلسته المنعقدة بتاريخ ######.

الرجاء تفعيل دور المقيم الخارجى المقترح لقسمكم الموقر وذلك من خلال إتصال مندوب الجـودة بالقسم بـالمقيم وإرسـال مسـتندات الجـودة الخاصـة بالقسـم لـه لتقيـيم المحتـوى العلمـى لبرنـامج دبلـوم تطبيقـات الـتحكم الأوتومـاتيكى فـى نظـم القوى الميكانيكيـة والمخرجـات التعليميـة المسـتهدفة لكل مقرر يقوم القسم بتدريسـه فـى البرنـامج وكذلك للبرنـامج ككل إستعداداً لتقدم الكلية للحصول على الإعتماد.

وتفضلوا بقبول فائق التحية والاحترام،،،

مدير وحدة ضمان الجودة والإعتماد

##################

تحريرا فى #####

Appendix (1): External Evaluator Report
(to be completed ASAP)

رجاء مراجعة محتوى وشكل تقرير برنامج البكالوريوس

تقرير مراجع خارجي لبرامج الدراسات العليا

يعبر التقرير التالي على الراي العلمي الموضوعي للسيد/أ.د. .....
الوظيفة الحالية:.....

تمت مراجعة وتقييم توصيف البرنامج المرفق بناء على طلب:
قسم: .....هندسة القوى الميكانيكية.....
كلية/معهد:.....كلية الهنسة.....
جامعة/أكاديمية:.....جامعة القاهرة.....
اسم البرنامج:.....دبلوم تطبيقات التحكم الأوتوماتيكى فى نظم القوى الميكانيكية.....
تاريخ المراجعة: / /
برجاء مراجعة المكونات التالية التي تساعد على التقييم الشامل لتوصيف البرنامج المعني وذلك باستخدام المقياس التالي:

أ) البيانات الاساسية للبرنامج:

العناصر	مستوفي	غير مستوفي
البيانات الاساسية.		
اسم المنسق.		

تعليقات المقيم:

.....

ب) التقييم الاكاديمي:

اهداف البرنامج:			
صياغة الاهداف	واضحة ☐	غير واضحة	☐
قابلة للقياس	كمي ☐	نوعي	☐

تعليقات المقيم:

.....
.....

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 - المهارات التطبيقية والمهنية - المهارات الذهنية - المهارات العامة	يتوافق يتوافق يتوافق يتوافق	☐ ☐ ☐ ☐	لا يتوافق لا يتوافق لا يتوافق لا يتوافق	☐ ☐ ☐ ☐
مخرجات التعلم المستهدفة للبرنامج تواكب التطور العلمي في مجال التخصص	تواكب	☐	لا تواكب	☐

تعليقات المقيم:

.....
.....

المعايير الاكاديمية:			
تحديد المعاير الاكاديمية	محددة	☐	غير محددة ☐
ملائمة المعاير الاكاديمية لمواصفات الخريج	ملائمة	☐	غير ملائمة ☐
يغطى توصيف البرنامج المعايير الأكاديمية المتبناة	تغطي	☐	لا تغطي ☐

تعليقات المقيم :

.....

هيكل البرنامج ومحتوياته
- تعليقات المقيم: .....

جـ) تقويم اعمال الطلاب:	
ملائمة الطرق المستخدمة في التقويم لطبيعة مخرجات التعلم المستهدفة	ملائمة ☐ غير ملائمة ☐

تعليقات المقيم:

.....

.....

د- مقررات البرامج:

يعتمد التقويم في هذا الجزء على المراجعة الدقيقة لتوصيف المقررات الخاصة بالبرنامج:

كود المقرر	المقرر رقم.....		المقرر رقم.....		المقرر رقم.....	
	يتحقق	لا يتحقق	يتحقق	لا يتحقق	يتحقق	لا يتحقق
- وضوح اهداف المقرر						
- ارتباط اهداف المقرر باهداقف البرنامج						
- قابلية مخرجات التعلم المستهدفة للقياس						
- ملائمة مخرجات التعلم المستهدفة لاهداف المقرر						
- توافق مخرجات التعلم المستهدفة مع مصفوفة المعارف والمهارات للبرنامج						
- ملائمة طرق التعليم والتعلم المستخدمة لتحقيق مخرجات التعلم المستهدفة						
- اتسام محتويات المقرر بالحداثة						
- الوسائل المستخدمة للتعليم والتعلم مناسبة للطرق المذكورة						
- طرق تقييم الطلاب المستخدمة ملائمة						
- المراجع المذكورة حديثة						

تعليقات اخرى:.....

.....

رأي المقيم النهائي:.....

.....

اسم المراجع الخارجي: **التوقيع:**

****

Program Evaluation Form

The ILO's of the program are clearly stated, measurable and complying with the National Academic Reference Standards for Engineering (NARS):

……
……

The ILO's of the course are in alignment with the program ILO's:

……
……

The breadth, depth and currency of the curriculum are suitable:

……
……

The balance between different elements of the curriculum is effective:

……
……

The teaching strategies and methods are:

- **Adequate for achieving the ILO's:**

……
……
……

- **Applying a range of different teaching methods:**

……
……
……

- **Consistent and effective across the program:**

……
……
……

The assessment strategies and methods:

- **Confirm the achievement of the appropriate academic standards:**

……
……
……

- **Ensure the achievement of the range of ILO's:**

……
……
……

- **Measure adequate levels of knowledge, intellectual and professional skills:**

……
……
……

An internal system for monitoring student progression and achievement is present:

……
……
……..

The record of final achievement by students including the rates profile of graduation implies satisfactory level of attainment:

……
……

(Attach additional sheets if necessary)

Courses are as per the 2013/2014 Bylaws

(يوجد نموذج فاضى لكل مقرر فى الدبلوم يتم تدريسه وله ملف مقرر)

Courses	Code	Indicator	Agree	Disagree	Suggestion for Improvement
Instrumentations for Measurements, Tests and Control	MEP 560	**(1) ILO's are:**			
		- Clearly stated			
		- Measurable			
		- Reflecting the aims of the programs			
		- Relevant and reflect the use of external reference standards at appropriate levels			
		- ILO's of program(s) are in alignment with course ILO's			
		(2) Teaching Methods are:			
		- Able to achieve ILO's			
		- Applying a range of different teaching methods			
		- Helping students independent learning			
		- Covering the knowledge and skills aspects			
		(3) Assessment methods are:			
		- confirms the achievement of the appropriate academic standards.			
		- Reflects the mission statement			
		- Assesses the achievement of the range of ILO's			
		- Adopts an appropriate range assessment processes.			
		(4) Achievement Levels: Pass: % Fail: %	**satisfactory**	**Unsatisfactory**	

Courses	Code	Indicator	Agree	Disagree	Suggestion for Improvement
Automatic Control – Theory and Applications	MEP 561	**(1) ILO's are:**			
		- Clearly stated			
		- Measurable			
		- Reflecting the aims of the programs			
		- Relevant and reflect the use of external reference standards at appropriate levels			
		- ILO's of program(s) are in alignment with course ILO's			
		(2) Teaching Methods are:			
		- Able to achieve ILO's			
		- Applying a range of different teaching methods			
		- Helping students independent learning			
		- Covering the knowledge and skills aspects			
		(3) Assessment methods are:			
		- confirms the achievement of the appropriate academic standards.			
		- Reflects the mission statement			
		- Assesses the achievement of the range of ILO's			
		- Adopts an appropriate range assessment processes.			
		(4) Achievement Levels: Pass: % Fail: %	**satisfactory**	**Unsatisfactory**	

Program Evaluation Form

1- **Intended Learning Outcomes "ILO's":**
   a. **Knowledge and Understanding: ……**
   b. **Intellectual skills: ……**
   c. **Professional and Practical Skills: ……**
   d. **General and transferable skills: ……**

The breadth, depth and currency of the curriculum are suitable:……
The balance between different elements of the curriculum is effective: ……
1- Curriculum structure and contents: ……
2- Program courses: ……
Evaluation of Program ILO's: ……
The teaching strategies and methods are: ……
The assessment strategies and methods: ……
- Ensure the achievement of the range of ILO's: ……

1- Program aims : ……
2- Intended Learning Outcomes "ILO's": ……
a. Knowledge and Understanding: ……
b. Intellectual skills: ……
c. Professional and Practical skills: ……
d. General and Transferable skills: ……
- **Program Admission Requirements: ……**
- **Regulation for progression and program completion: ……**
- **Evaluation of program ILO's: ……**

****

Evaluation of Program Report (2013/2014)

B. Statistics: ……
Academic Standards……

1- Achievement of program ILO's commentary: ……
a. Knowledge and Understanding: ……
b. Intellectual skills: ……
c. Professional and Practical skills: ……
d. General and Transferable skills: ……

……
……
……
……
……
……
……

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Appendix (2)
Response to reviewers' comments
(to be completed ASAP)

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Appendix (3)
Contribution of Individual Courses to ILO's

- 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 which are 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 Engines	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	

The following table (2) give the contribution of individual courses to each of **the Program ILO's** as given in the program specification file [**note:** those program IOL's are also are given below after table (2)]. 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 (2)

Code	Course Title	Program ILO's Covered (By No.)-see the ILO's in program specifications
	Compulsory courses	
MEP560	Instrumentation for Measurements, Tests & Control in Mech. Power System	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 System	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 Fillin	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	ApplicationsofIndustrialPipe lines:Types, Design, Construction& Installatior	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	SelectedTopicsinControlofCombustionSystems&Internal Combus. Engines	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

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&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- LaplaceTransform&inverseLaplace technique to solve 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-Maindefinitions and characteristics of dynamic response of 1st & 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 & 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 mech. 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 types of hydraulic circuits & systems.
a19-Concepts ofreadinghydraulic circuitsschematicsfor proper analysis of 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-Structureof PLC languish for ladder logic diagram, statement list diag. & function block diagram.
a26-Basics of programming, running, simulation, diagnostics & trouble-shooting of various PLC systems.
a27-Basics & requirements of performing short-term design project in 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 & how to do them, & 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 HVACVirtLab.
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-Dconduction,uniform&non-uniform thermal conductivity, heat sources &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 & 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 & to give the participants skills and knowledge to solve some practical and actual PLC examples and control projects.

a47-Analogy& Difference between components, operation, & functions of Hydraulic & Pneumatic circuits.
a48- Basics of Pneumatic logic circuits&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 and validity of different types of virtual lab programs by doing parallel engineering calculations.
b3-Searching for scientific and technical information and adopting automatic control self-E-learning capabilities.
b4- Analyze and compare Performance & time response of different types of automatic control systems.
b5-Apply mass, thermodynamic & energy balance analysis for different mech. 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 and 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, & 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 types automatic control problems of mech. power systems & energy transfer processes.
c2-Perform professional designs for different Hydraulics, Pneumatics,PLC& 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 diff. Hydraulics,Pneumatics,PLC & 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 & computer applications (Excel, Mat lab, Virtual labs, .etc).
d4-Prepare & write reports, Manipulate and sort data, Think logically & 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.

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أ.م/ محسن سيد سليمان
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