Cairo University
Faculty of Engineering
Mech. Power Department

CAIRO UNIVERSITY
FACULTY OF ENGINEERING

ACC
VirtualLabs
Automatic Control Circuits & Virtual Labs
for Mechanical Power Systems

دبلوم تطبيقات التحكم الأوتوماتيكى فى نظم القوى الميكانيكية

MEP 576 Using Virtual Lab Applications for Control of Central Water Heating and Distribution Systems

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What do we study? **ملاحظة:** هذا ليس مقررلتدريس نظريات خطوط الأنابيب ولكن <u>مقررمتقدم</u> للتدريب على نظم التحكم الأوتوماتيكى لهذه الخطوط

مكق 576 تطبيقات المعامل الإفتراضية فى نظم تسخين وتوزيع المياه المركزية:

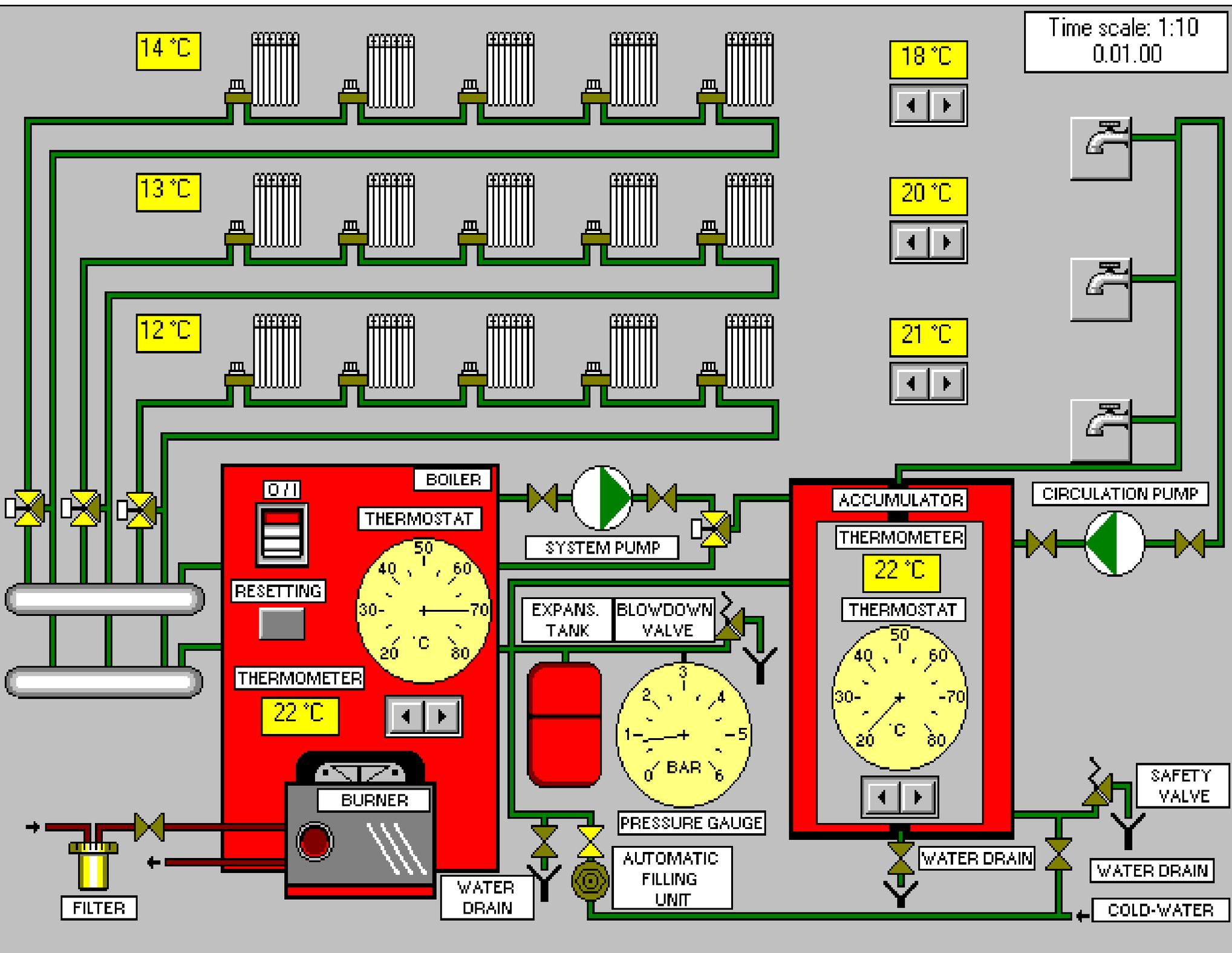**Interactive Automatic Control System for a civil heating plant for hot water distribution:**
دراسة والتعرف على وتحليل عناصرالعديد من مكونات وأجهزة ومعدات نظم التحكم الآلى المستخدمة فى محطات تسخين وتوزيع المياه المركزية على عدد كبير من المستهلكين بأحمال مختلفة. كما يتضمن المقرركذلك دراسة حالة تطبيقية من خلال برنامج معامل إفتراضية تفاعلى للتحكم الأوتوماتيكى وتشغيل وإدارة كافة أجزاء محطة تسخين وتوزيع مياه مركزية.

What do we have in the Industrial Central Water Heating and Distribution Systems?

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

Time scale: 1:10
0.01.00

14 ℃
13 ℃
12 ℃

18 ℃
20 ℃
21 ℃

BOILER
O / I
THERMOSTAT
50
40   60
30—   —70
20   80
℃
RESETTING
THERMOMETER
22 ℃

SYSTEM PUMP

EXPANS. TANK
BLOWDOWN VALVE

3
2   4
1   5
0   BAR   6
PRESSURE GAUGE

ACCUMULATOR
THERMOMETER
22 ℃
THERMOSTAT
50
40   60
30—   —70
20   80
℃

CIRCULATION PUMP

BURNER

WATER DRAIN

AUTOMATIC FILLING UNIT

WATER DRAIN

SAFETY VALVE

WATER DRAIN

COLD-WATER

FILTER

Course Specifications & Basic Information			
1. Title:	**Using Virtual Lab Applications for Control of Central Water Heating and Distribution Systems**		**Code:MEP576**
2.Credit hrs per week	**Lectures= 3 hours per week**	**Tutorial= 0.0**	**Practical= 0.0**	**Total=3 Cr.Hrs**

B- Professional Information

1. Course description: Overall Aims:

This is 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.

2. Intended Learning Outcomes of Course (ILOs):

a) Knowledge and Understanding:

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

- Theories, Information, sciences and specialized technologies in the fields of automatic control of mechanical power equipments and systems of Central Water Heating and Distribution Systems.
- Moral, legal essentials &quality control principals related to the graduate's professional practices in automatic control fields.
-Various effects of eng. professional practices of Central Water Heating and Distribution Systems on different components of the environment.
-Methods used for emission/pollution control and energy rationalization and maximization of the benefits of Central Water Heating and Distribution Systems.

b) Intellectual Skills:

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

-Identify scientific and practical problems related to auto. control of Central Water Heating and Distribution Systems.

- Analyze and propose professional, technical solutions and algorithms for automatic control problems.

- Analytical reading of research and report topics related to control of Central Water Heating and Distribution Systems.

- Evaluate and estimate various risks involved in professional practices related to of Central Water Heating and Distribution Systems.

-Take effective actions and professional decisions in accordance with and/or based on available data and technical information.

c) Professional and Practical Skills:

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

Apply professional and practical skills in the fields of automatic control of Central Water Heating and Distribution Systems.

Execute short term project and write engineering technical report that involves graphs, charts, and diagrams.

Perform professional presentation and suggest possible alternative solutions for automatic control problems of Central Water Heating and Distribution Systems.

Write technical requirements & selecting engineering reference standards for Central Water Heating and Distribution Systems.

d) General and Transferable Skills:

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

-Perform engineering calculations, draw feed-back control circuits, block diagrams, graphical presentation of experimental data, and perform data-regression analysis.

-Transfer knowledge, Work in group, & Communicate in written & oral forms, in English.

- Use IT& evolutionary technological tools& PC applications (Excel, Mat lab, Virtual labs, .etc).

- Prepare & write reports, Manipulate & sort data, Think logically, and continuous self-E-learning.

- Identify practical problems, compare between different technologies for measurement systems.

-Organise & manage time & resources effectively; for short-term and longer-term commitments.