

	Engineering Faculty of Engineering								
Course Specifications									
Program(s) on which this course is given						Bachelor Deg	ree of	Mechanical Power E	ngineering
Department offering the program						Mechanical Po		<u> </u>	
Department offering the course						Mechanical Po	ower E	Engineering	
Academic I	Level		,			Fourth Year			
Date						2023-2024			
Semester(b	ased on fi	inal exam	timin	g)	I	Fall √	Spri	ng	
A- Basic In	formati	on							
1. Title:	Application of Virtual Labs in Mechanical Power							ws)	
2. Units/Credit week:	hours per	Lectures	1	Tutorial	1	Practical	1	Total	3
<b>B- Professi</b>	onal Inf	ormatio	n						
1. Course description:	Turbine and Exhaust- GT Ignition System- Bearing and Seals- Lubrication and Lube Oil- Lube Oil Pumps- Lube Oil Filters and Coolers- Lube Oil Instrumentation- Hydraulic Oil System- Trip Oil System- GT Fuel System – Fuel Gas Supply System- Fuel Gas Control System- Liquid Fuel System- Liquid Fuel system Operation- Pneumatic Starting System- Hydraulic Starting System- Diesel Starting System- Enclosures- Fire Detection- Gas Detection-Fire Extinguisher Systems- Principles of Power Generation- Generator Components- Generator Lube Oil- Generator Control- Principles of Compression- Compressor Components- Compressor Lube Oil- Compressor Control System. The course uses Virtual Lab method by practical on-line interactive program. This control Virtual Lab is E- self-learning software. The software includes large number of examples for GT parts, 3-D animations, E- learning labs, quizzesetc. The Virtual Lab along with professional course notes and training sheets provide typical example for modern Blended, self-learning education technique. In this course, it is used for								
2. Learning Outcomes of Course (LOs):	<ul> <li>studying and analyzing various aspects related to GT automatic control and energy systems transfer.</li> <li>a) Knowledge and Understanding:</li> <li>Having successfully completed this course, the student should have knowledge and understanding of: <ul> <li>Theories, Information, sciences and specialized technologies in the fields of automatic control of mechanical power equipments and systems of Industrial GT Plants.</li> <li>Moral, legal essentials and quality control principals related to the graduate's professional practices in automatic control fields.</li> <li>Various effects of engineering professional practices of Industrial GT Plants on different components of the environment.</li> <li>Methods used for emission/pollution control &amp; energy rationalization and maximization of the benefits of Industrial GT Plants.</li> </ul> </li> <li>b) Intellectual Skills: <ul> <li>Having successfully completed this course, the student should have the ability to:</li> <li>-Identify scientific and practical problems related to automatic control of Industrial GT Plants.</li> <li>Analyze and propose professional, technical solutions and algorithms for automatic control problems.</li> <li>Analyze and propose professional decisions in accordance with and/or based on available data and technical information.</li> <li>c) Professional and Practical Skills:</li> <li>Having successfully completed this course, the student should have the ability to:</li> <li>Apply professional and practical skills in the fields of automatic control of Industrial GT Plants.</li> <li>Execute short term project &amp; write engineering technical report that involves graphs, charts, &amp; diagrams.</li> <li>Perform professional and practical specing technical report that involves graphs, charts, &amp; diagrams.</li> <li>Perform professional presentation and suggest possible alternative solutions for automatic control problems of Industrial GT Plants.</li> </ul> </li> <li>Apply professional and practical skills in the fields of automatic control of Industri</li></ul>								

of experimental data, and perform data-egression analysis.  - Transfer knowledge, Work in group, & Communicate in written & oral forms, in English Use TR& evolutionary technological tools& PC applications (Excel, Mat lab, Virtual lab, etc.) Prepare & write reports, Manipulae & sort data, Think logically, and continuous self-E-tearning Use TR& manage time & resources effectively, for short-term and longer-term commitments Organise & manage time & resources effectively, for short-term and Solvare of TR & recent modern Virtual Lab Computer Applications in practical automatic control systems. 3. Apply educational-practical Training Virtual Lab tool Hardware and Solvare of TR & recent modern Virtual Lab Computer Applications of practical automatic control systems. 3. Apply educational-practical Training Virtual Lab tool Instrumentation and maximization of the benefits of industrial GT Plants. 6. Recognize atrious types and applications of practical GT automatic control systems. 7. Understand various schematics & symbols of GT Hydraulic/Pncumatic control systems. 8. Apply englication granical arise symbol schematics of GT Vistanic control systems. 8. Laberity various schematics & symbols of GT Hydraulic/Pncumatic control systems. 8. Laberity and the second analysis to select proper GT control systems and subsystems. 11. Exchange knowledge with engineering community. 12. Work in stressil environment and within constraints. 13. Communicate effectively, Effectively manage tasks and resources, Refer to relevant literature 3. Contents Topic Topic Topic Composer Components-Composer Section- Ream CT Engine Design- Operating Principles of Dower Generation - Renerating Sestem Section- Ream Even CT Engine Design- Operating Principles of Compressor Components-Composer section- Part Mark Section Control System - Liquid Fuel System - Liquid Fuel System - Ecole Study/Reports (1) Extension of Mark Section Control Systems 4. Contents Topic Topics Composersed Control System - Liquid Part System - Liquid Part System - Liqu										
1. Recognize various types & applications of Virtual Lab Techniques to study automatic control systems.         2. Comprechen and follow recent developments of both Hardware and SOIIware of IT & recent modern Virtual Lab Computer Applications in practical untomatic control systems.         3. Apply educational-gratical training Virtual Lab to understand Basics & cessenilals of GT Systems.         4. Identify various types and main essential parts of Industrial GTs Turbine Systems.         5. Study different methods for emission/pollution control & energy rationalization and maximization of the benefits of Industrial GT Hattical GT automatic control systems and subsystems.         7. Understand various schematics & symbols of GT Hydraulic/Pneumatic control systems and subsystems.         9. Perform Evulation & function analysis to sclect proper GT control systems with optimum performance.         10. Examine of Maintenance and Troubleshooting of GT automatic control systems and subsystems.         11. Exchange knowledge with engineering community.         12. Work in stresful environment and within constraints.         13. Communicate effectively. Effectively manage tasks and resources, Refer to relevant literature         Topic         This is an interactive computer-based training course that includes the following topics items:         GT Engine Design- Operating Principles of Compression - Compressor Section-Diffuser & Control - System - Fuel Gas Supply System - Fuel Gas Control       3       2       1         Tiffus the Dystem- Fuel System Principles of Compression - Compressor Com	-Trans - Use - Prep - Iden	sfer kn IT& e are & tify pr	nowledge, Work is volutionary techn write reports, Ma ractical problems,	n group, nological anipulate compare	& Communicate in wr tools& PC application & sort data, Think log between different tecl effectively; for short-	s (Excel, Mat lab, Vir ically, and continuous nnologies for measure term and longer-term	rtual la s self-E ement s	bs, .etc l-learni systems	ng. S.	
Virtual Lab Computer Applications in practical automatic control systems.       3. Apply editional-practical framing Virtual Lab to understand basics & essentials of GT Systems.         4. Identify various types and main essential parts of Industrial Gas Turbine Systems.       5. Study different methods for emission/pollution control & energy rationalization and maximization of the benefits of Industrial GT Plants.         6. Recognize different types and applications of practical GT automatic control systems and subsystems.       7. Understand various schematics & symbols of GT Hydraulic/Pneumatic control subsystems. & Circuits.         8. Apply engineering standards & practice reading symbol-schematics of GT vibration control systems.       9. Perform Fvulaution & function analysis to scleet proper GT control systems with optimum performance.         10. Examine of Maintenance and Troubleshooting of GT automatic control systems and subsystems.       11. Exchange knowledge with engineering community.         12. Work in stressful environment and within constraints.       13. Communicate effectively. Effectively manage tasks and resources, Refer to relevant literature         Jorden Matter Stressful environment and within constraints.         13. Contents       Topic       Topic         Topic Stressful environment and within constraints.         14. Outopic Joseful environment and within constraints.       13. Contents         Topic Stressful environment and within constraints.         Topic Joseful environment and within constraints. <td colsp<="" td=""><td></td><td>-</td><td>• •</td><td>application</td><td>Learning Outcomes as ons of Virtual Lab Tec</td><td>per NARS 2018 hniques to study auto</td><td></td><td></td><td>•</td></td>	<td></td> <td>-</td> <td>• •</td> <td>application</td> <td>Learning Outcomes as ons of Virtual Lab Tec</td> <td>per NARS 2018 hniques to study auto</td> <td></td> <td></td> <td>•</td>		-	• •	application	Learning Outcomes as ons of Virtual Lab Tec	per NARS 2018 hniques to study auto			•
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7. Understand various schematics & symbols of GT Hydraulic/Pneumatic control subsystems.       8. Apply engineering standards & practice reading symbol-schematics of GT vibration control systems.         9. Perform Evaluation & function analysis to select proper GT control systems and subsystems.       10. Examine of Maintenance and Troubleshooting of GT automatic control systems and subsystems.         11. Exchange Knowledge with engineering community.       12. Work in stressful environment and within constraints.       13. Communicate effectively. Effectively manage tasks and resources, Refer to relevant literature         Total control systems for the stress of the system set of the syste	5.Stuc	5. Study different methods for emission/pollution control & energy rationalization and maximization of								
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Time for Preparing for the term exam       3       2       1         Total teaching hours in 15 weeks (+1 office hr/wk)       45       30       15         4. Teaching and Learning Methods       Lectures (√)       Practical Training/ Virtual Laboratory (√)       Seminar/Workshop (x)       3       2       1         4. Teaching and Learning Methods       Lectures (√)       Practical Training/ Virtual Laboratory (√)       Seminar/Workshop (x)       5         Also for Teaching and Learning: Lectures and problem solving in tutorial classes.       Assignments /Homework (√)       Other: Reports         Also for Teaching and Learning: Lectures and problem solving in tutorial classes.       Foroup discussions in lectures and tutorial classes.       Foroup discussions in lectures and tutorial classes.         - Information collection from text material, class notes and the Internet sites.       Report and research assignments. Three assignment Sheets (1, 2 and 3)       Foroup discussions in lectures and tutorial classes.         - Hand-outs materials.       Student Assessment Methods:       Week         - Assessment 0: Sheet-0       Week#2         - Assessment 1: Sheet-1       Week#3         - Assessment 2: Sheet-2       Week#3         - Assessment 3: Sheet-4       Week#1         - Assessment 4: Sheet-6       Week#11         - Assessment 5: Sheet-8       Week#11	GT Engine Design- C Diffuser & Combusti Lube Oil- Lube Oil F Oil System- Trip Oil System- Liquid Fuel Hydraulic Starting Sy Fire Extinguisher Sys Lube Oil- Generator	Operation on- Tu Pumps- Syster Syster stems- Contro	ing Principles- G urbine & Exhaust - Lube Oil Filters m- Fuel System – m- Liquid Fuel sy - Diesel Starting S - Principles of Pow ol- Principles of Q	T Engine - Ignition & Coole - Fuel Gas /stem Ope System- E wer Gene	Case and Air inlet- Co System- Bearing & S rs- Lube Oil Instrume Supply System- Fuel eration- Pneumatic Sta Enclosures- Fire Detect ration- Generator Com	ompressor Section- eals- Lubrication & ntation- Hydraulic Gas Control rting System- tion- Gas Detection- ponents- Generator		ek for 14 weeks before The Final Term	for 14 weeks before The Final Term	
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Learning Methods       Class Activity (\sqrt{)} Case Study/Reports (\sqrt{)}       Projects (x)         E-learning (\sqrt{)}       Assignments /Homework (\sqrt{)}       Other: Reports         Also for Teaching and Learning:	4. Teaching and			Practica	al Training/ Virtual			30	15	
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Mid term Exam	Tissessment, sheet 12 & sheet 15 Tevrew General Report						Week#13			
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Final Term Exam to assess gains of all completed topics and the entire course LO's.	End of Term		
Weighting of Assessments			
Assignments & class performance	5 pts		
Attendance & Written Reports	10 pts		
Mid-term Exam	15 pts		
Final-term Examination	45 pts		
-Total	75 pts		

## 6- List of References (Note that this is a Self-Study Virtual Lab Course):

1- Several Class Notes, Reports, and Self-study Materials prepared by Course Instructor.

2- "Fundamentals of Gas Turbine Operation, Version 2.0 for Windows": E-Learning Software and GT Virtual Lab program developed by "Systran, Inc. 800.851.8830" acc-vlab.cu.edu.eg ملاحظة: يوجد عدد كبير من المادة العلمية والأفلام والمراجع للمقرر موجودة على موقع معمل التحكم

## 7. Facilities Required for Teaching and Learning: Data Show, Laptop Computer and access to the net.

Course Coordinator:	Associate Prof. Mohsen S. Soliman
Head of Department:	Prof. Dr. Sayed Kaseb
Date:	July 2023