Course Specifications of:
Selected Topics in Turbo-machinery *(MEP 707)*

Program(s) on which the course is given: Ph.D. in Mechanical Power Engineering
Compulsory or Elective element of program: Elective
Department offering the program: Mechanical Engineering / power
Academic year / Level: year/ 2014/2015
Date of specification approval: 2012

A. Basic Information

Title: Selected Topics in Turbo-machinery **Code: MEP 707**
Credit Hours: 3 **Lecture: 3**
Tutorial: **Practical: -** **Total: 3**

B- Professional Information

1- Overall aims of course:

This course aims to provide the student with:

1- The applications of advanced thermodynamic equations on the turbo machinery.
2- The professional practice of turbines and compressors, components and environmental.
3- Understand how to control the power required from the turbines and compressors.

2- Intended learning outcomes of course (ILOs)

By completion of the course, the student should be able to:

2.1 Knowledge and understanding

a1. Have a modern and professional knowledge in the turbo machines. (2.1.1)
a3. Understand and respect the values, principles of quality, methods and limitations in the professional practice in the turbo machines. (2.1.4)
a4. Advanced Knowledge of the effects of exercise on the environment and ways of development and conservation. . (2.1.5)
a5. Describe the current problems in critically evaluated manner related to turbo-machinery. (2.1.6)
a2. Search for the advanced scientific developments in the area of turbo machinery engineering. (2.1.7)

2.2 Intellectual skills

b1. Analyze and assess information in turbo-machinery engineering and draw analogies to solve problems. (2.2.1)
b2. Ability to analyze, evaluate information and solve specific turbo-machinery problems on the basic of limited and contradictory information. (2.2.3)
b3. Capability to write scientific papers. (2.2.4)
b4. Have creativity and make good decisions in different professional aspects. (2.2.7)

b5. Evaluate the relative enhancement in the system or process performance due to the innovative part or procedure application. (2.2.8)
b6. Add new information to the knowledge by carry out a research studies in the turbo machines engineering. (2.2.10)

2.3 Professional and practical skills

c1. Evaluation and writing technical reports in the field of turbo machines. (2.3.2)
c2. Adaptation assessment methods and tools existing in the area of the turbo machines field.(2.3.3)
c3. Use the various software programs for simulating the turbo-machinery features. (2.3.6)
c4. Ability to develop innovative solutions, demonstrating flexibility and resourcefulness in the turbo machines field. (2.3.8)

2.4 General and transferable skills

d1. Capacity to communicate ideas effectively to a range of audiences inside and outside the turbo machines field. (2.4.1)
d2. Analyzing and synthesizing information or data from a variety of sources and demonstrate effective IT capabilities to serve the development in the turbo machines field. (2.4.3)
d3. Capability to demonstrate of ethical, legal, social and civic responsibility as a researcher and member of the turbo machine and ability to lead the team work. (2.4.6)
d4. Ability to demonstrate a high level of competence the management of time and scientific meetings. (2.4.7)

3- Contents

No. of weeks	Topic	No. of hours
1	Basic equations for turbo machinery (Continuity, momentum and energy equations)	3
2	Basic cycles of gas turbines	3
3	Applications of gas cycle in jet engines	3
4	Types of steam turbines, Two dimension cascade	3
5	History of the Gas Turbines, Introduction, 1970 to 1980, 1980 to 1990, 1990s till now, Basic Concept of Turbo machines, Introduction, Types of Turbo machines,	3
6	Dimensional Analysis, Model Testing, Compressible Flow Machines, Prototype and Mode Efficiency, Dimensionless Specific Speed,	3
7	Basic Laws and, Equations, Continuity, Steady Flow Energy Equation (First Law of Thermodynamics), Newton's Second Law of Motion, Entropy (Second Law of Thermodynamics)	3

8	Mid term	3
9	Inlet Casing, Impeller, Diffuser, Inlet Velocity Limitations,Pre-Whirl and Inlet Guide Vanes, A Mach Number in the Diffuser ,	3
10	Centrifugal Compressor Characteristics,	3
11	Surging, Rotating Stall, Choking, Characteristic Curve	3
12	Axial Flow compressor ,Introduction, Compressor Stage, Stator (Nozzle) and Rotor, Blade Loading Coefficient,	3
13	Reaction Ratio, Effect of Reaction Ratio on Stage Efficiency, Blade Types, Reaction Blading	3
14	Oral Exam	3
15	Final Exam.	3
	Total	45

4- Course Matrix

ILO's code number	Teaching/learning methods and strategies	Assessment methods and strategies
2.1.1 2.1.4 2.1.5 2.1.6 2.1.7	Formal lectures	Individual coursework assignments, quizzes, oral discussions and reports. Mid-term and /or final written examination is given.
2.2.1, 2.2.3 2.2.4, 2.2.7 2.2.8, 2.2.10	Analysis and problem-solving skills are developed through tutorial/problem sheets and small group exercises.	Analysis and problem-solving skills are assessed through oral and written examinations.
2.3.2, 2.3.3 2.3.6 , 2.3.8	Virtual experiments demonstrations	Coursework exercises and reports, project reports and presentations.
2.4.1 2.4.3 2.4.6 2.4.7	Those skills are not explicitly taught; however, along the course of study the student will acquire those skills to be able to perform his obligations. Attendance of seminars, workshops or conferences will help the student in developing those skills. Presentation by students (either group or individual) will train students for those skills.	Project presentation

5-Assessment schedule

Assessment 1	Assignments	on weeks	1, 3, 6
Assessment 2	Quizzes	on weeks	2, 4, 9, 13
Assessment 3	Mid-term exam	on weeks	8
Assessment 3	Oral exam	on week	14
Assessment 4	Final exam	on week	15

6- Weighting of assessments

20% (60 marks) Home assignments, Quizzes, and reports
20% (60 marks) Mid-term examination and Oral examination
60% (180 marks) Final-term examination
100% (300 marks) Total

7- List of References

a- Course Notes

1- Course notes prepared by instructor

b- Books

1- Gas Turbine Engineering Handbook, Boyce, Meherwan P.2012
2- "Gas Turbines" V. Ganesan, Mc Graw Hill, Second Print, 1999.

7.2 websites

-www.4shared.com
-yahoo group mail
- www.sciencedirect.com

8- Facilities required for teaching and learning

Presentation board, computer and data show
Laboratory

Course coordinator: Prof. Dr. Ahmed M. Osman
Course instructor: Prof. Dr. Ahmed M. Osman

Head of Department: Prof. Osama Ezzat

Matrix of course content and ILO's

Course Title: **Selected Topics in Turbo-machinery** **Code**: **MEP707**
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Course content	ILO's A	ILO's B	ILO's C	ILO's D
Basic equations for turbo machinery	a1	b1		d1
Basic cycles of gas turbines	a1	b2		d1
Applications of gas cycle in jet engines	a1	b1	c1	d1
Types of steam turbines, Two dimension cascade.	a3	b2	c2	
History of the Gas Turbines, Introduction, 1970 to 1980, 1980 to 1990, 1990s till now.	a2	b2,b5	c2	d4
Dimensional Analysis, Model Testing, Compressible Flow Machines, Prototype and Mode Efficiency, Dimensionless Specific Speed.	a2,a4		c2,c4	
Basic Laws and, Equations, Continuity, Steady Flow Energy Equation (First Law of Thermodynamics), Newton's Second Law of Motion, Entropy (Second Law of Thermodynamics)	a3	b3		d1,d3
Inlet Casing, Impeller, Diffuser, Inlet Velocity Limitations.	a3	b4	c2	d2
Pre-Whirl and Inlet Guide Vanes, A Mach Number in the Diffuser.	a3,a5	b2		d1
Centrifugal Compressor Characteristics,	a1	b3	c3	
Surging, Rotating Stall, Choking, Characteristic Curve	a2	b1	c3	
Axial Flow compressor ,Introduction, Compressor Stage, Stator (Nozzle) and Rotor, Blade Loading Coefficient,	a2	b4	c3	d4
Reaction Ratio, Effect of Reaction Ratio on Stage Efficiency, Blade Types	a1	b4		d4

Matrix of course aims and ILO's

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1- The applications of advanced thermodynamic equations on the turbo machinery.	a1,a4	b1	c1	d2
2- The professional practice of turbines and compressors, components and environmental.	a3,a2	b2,b3	c2,c3	d4
3- Understand how to control the power required from the turbines and compressors.	a3	b2,b5	c2	d4