Course Specifications of: Advanced Heat and Mass Transfer MEP 606

Program(s) on which the course is given : Post Graduate **M. Eng.** 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: Advanced Heat and Mass Transfer **Code: MEP 606**
Credit Hours: 3 **Lecture: 3**
Tutorial: **Practical:** **Total: 3**

B- Professional Information

1- Overall aims of course:
Upon completing this course, it is expected that the students will be able to:

1- Understand the basic principles of heat transfer with a broad range of engineering applications.
2- Solve transient heat conduction and two-dimensional, steady-state conduction with numerical methods.
3- Know all the standard topics in convection heat transfer and boiling and condensation with an emphasis on physical mechanisms and practical applications.
4- Present empirical relations for calculating forced convection heat transfer and will also treat the subjects of natural convection and boiling and condensation heat transfer.
5- Know all types of heat exchangers and studies the heat pipes.

2- Intended learning outcomes of course (ILOs)
By completion of the course, the student should be able to:

2.1 Knowledge and understanding

a1. Define theories, fundamentals and principles of heat and mass transfer. (2.2.1)
a2. Outline the scientific developments in heat and mass transfer. (2.1.3)
a3. Explain the basic principles of ensuring higher levels of quality in heat and mass transfer practice. (2.1.5)
a4. Illustrate the methodologies used in computational and experimental heat and mass transfer research. (2.1.7)

2.2 Intellectual skills

b1. Analyze and assess information in the heat and mass transfer and draw analogies to Solve problems. (2.2.1)
b2. Solve problems in spite of the lack of some data. (2.2.2)
b3. Illustrate different knowledge sources to solve problems.(2.2.3)

b4. Make professional decisions in various professional contexts.(2.2.4)

2.3 Professional and practical skills

c1. Perform basic professional and modern skills in heat and mass transfer. (2.3.1)
c2. Plan and implement heat and mass transfer experimental design and evaluate testing. (2.3.4)

2.4 General and transferable skills

d1. Use information technology in order to serve the development of professional practice. (2.4.2)
d2. Use different sources for obtaining information and knowledge.(2.4.4)
d3. Conduct self-learning and continuous education practices.(2.4.8)

3- Contents

Topic No.	Topic	No. of weeks	Total no. of hours
1	Non-uniform heat conduction – uniform heat conduction - multi-dimensional heat conduction –	2 1	6 3
2	Dimensionless groups	1	3
3	**Convection heat transfer** Forced convection heat transfer Natural convection heat transfer **Mid-term exam**	 3 1 1	 9 3 3
4	**Boiling and Condensation** Pool boiling Forced convection boiling Condensation physical mechanisms Film condensation on a Vertical plate and radial system Film condensation in horizontal tubes and horizontal tube banks	3	6
5	Heat exchanger - Heat pipes (types - the limits of - the operating fluids)	2	6
6	**Exam**	1	3
	Total	15	45

4- Course Matrix

ILO's code number	Teaching/learning methods and strategies	Assessment methods and strategies
2.1.1 2.1.3 2.1.5 2.1.7	Formal lectures	Individual coursework assignments, quizzes, oral discussions and reports. Mid-year and /or final written examination is given.
2.2.1 2.2.2 2.2.3	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.

2.2.4		
2.3.1 2.3.4	Virtual experiments demonstrations	Coursework exercises and reports, project reports and presentations.
2.4.2 2.4.4 2.4.8	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	2, 5, 9, 11
Assessment 2	Quizzes	on weeks	6, 12
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

7.1 Text books

-Frank P. Incropera, "Fundamentals of Heat and Mass Transfer", John Wiley & sons, 5th edition, 2002.
- J. P. Holman, "heat transfer", McGraw-Hill, Inc. 9th edition, 2003.

7.2 websites

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

8- Facilities required for teaching and learning

Board and computer equipped with overhead projector
Laboratory

Course coordinator: Prof. Dr. Mohamed Moawed , Prof. Dr. Nabil Shafieek

Course instructor: Prof. Dr. Mohamed Moawed , Prof. Dr. Nabil Shafieek

Head of Department Prof. Dr. Osama Ezzat Abdellatif

Matrix of course content and ILO's

Course Title: **Advanced Heat and Mass Transfer** **Code**: **MEP 606**
Lecture: 3 **Tutorial**: ---- **Practical**: ---- **Total:** 3
Program on which the course is given: Post Graduate **M. Eng.** in Power Engineering.
Major or minor element of program: Elective
Department offering the program: Mechanical Engineering / Power
Department offering the course: Mechanical Engineering / Power
Academic year / level: 2014/2015. Date of specifications approval: 2012

Course content	ILO's A	ILO's B	ILO's C	ILO's D
Non-uniform heat conduction – uniform heat conduction - multi-dimensional heat conduction –	a1 a1	b1 b1		
Dimensionless groups	a1	b2	c1	d2
Convection heat transfer Forced convection heat transfer Natural convection heat transfer	a1 a2	b2		d1, d2
Boiling and Condensation Pool boiling Forced convection boiling Condensation physical mechanisms Film condensation on a Vertical plate and radial system Film condensation in horizontal tubes and horizontal tube banks	a1 a2 a2 a3 a2 a4	b3	c1 c2	d3
Heat pipes (types - the limits of - the operating fluids)	a1	b3	c1	d1, d3
Non-uniform heat conduction – uniform heat conduction - multi-dimensional heat conduction –	a1 a1	b4 b4		d1, d3

Matrix of course aims and ILO's

Course Title: **Advanced Heat and Mass Transfer** **Code**: **MEP 606**
Lecture: 3 **Tutorial**: ---- **Practical**: ---- **Total:** 3
Program on which the course is given: Post Graduate **M. Eng.** in Power Engineering.
Major or minor element of program: Elective
Department offering the program: Mechanical Engineering / Power
Department offering the course: Mechanical Engineering / Power
Academic year / level: 2014/2015. Date of specifications approval: 2012

Course aims	ILO's A	ILO's B	ILO's C	ILO's D
1- Understand the basic principles of heat transfer with a broad range of engineering applications.	a1	b1, b2		
2- Solve transient heat conduction and two-dimensional, steady-state conduction with numerical methods.	a2	b2, b3		d2,d1
3- Know all the standard topics in convection heat transfer and boiling and condensation with an emphasis on physical mechanisms and practical applications.	a1,a4	b3	c1,c2	d2
4- Present empirical relations for calculating forced convection heat transfer and will also treat the subjects of natural convection and boiling and condensation heat transfer.	a1,a3	b2,b4	c1	d2,d3
5- Know all types of heat exchangers and studies the heat pipes.	a2, a2	b3		d2