Course Specifications of:
Selected Topics in Heat Transfer (MEP 701)

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

A. Basic Information

Title: Selected Topics in Heat Transfer **Code: MEP 701**
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 knowledge and skills to:

1- Produce and develop advanced researches in different topics of heat transfer applications.
2- Use software related to heat transfer problems.
3- Solve heat transfer problems in different applications.
4- Design computer programs to solve heat transfer applications
5- Design heat transfer equipment.

2- Intended learning outcomes of course (ILOs)

2.1 Knowledge and understanding

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

a1. Explain modern concepts in heat transfer enhancement techniques. (2.1.1)
a2. Characterize the computational and experimental techniques used in heat transfer. (2.1.2)
a3. Explain advanced concepts for quality of the professional practice in heat and mass transfer engineering. (2.1.4)
a4. Review advances and developments in different areas of heat transfer applications such as forced, mixed and natural convection as well as boiling and condensation. (2.1.7)

2.2 Intellectual skills

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

b1. Analyze and assess information in different heat and mass transfer engineering applications and draw analogies to solve problems. (2.2.1)
b2. Propose assumptions for a research study in heat transfer. (2.2.3)
b3. Assess and analyze risks in application of heat transfer equipment (2.2.5)
b4. Evaluate the relative enhancement in equipment/process design for various data (2.2.8)

b5. Formulate valuable research questions in the different heat transfer applications. (2.2.11)

2.3 Professional and practical skills

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

c1. Solve conduction heat transfer equations with convective and radiation boundary conditions. (2.3.1)
c2. Solve heat transfer problems and determine the most dominant mode of heat transfer in specific applications. (2.3.3)
c3. Perform design calculations for heat exchanger, solar collectors, swimming pools, etc. (2.3.6)

2.4 General and transferable skills

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

d1. Communicate ideas effectively to a range of audiences inside and outside the heat transfer field. (2.4.1)
d2. Adopt self-assessment and adopt life-long learning. (2.4.4)
d3. Demonstrate ethical, legal, social and civic responsibility as a researcher and member of the heat transfer and ability to lead the team work. (2.4.6)
d4. Manage time at an advanced level. (2.4.7)

3- Contents

Week no	Topic	No. of hours
1	Advanced topics in steady state conduction heat transfer	3
2	Advanced topics in transient conduction heat transfer	3
3	Differential formulation of the basic laws governing convection and inegral solution for 1D	3
4	Advanced topics in heat transfer for external flow	3
5	Advanced topics in heat transfer for external flow (Continued)	3
6	Advanced topics in heat transfer for channel flow	3
7	Advanced topics in natural convection	3
8	Mid-term	3
9	Advanced topics in natural convection (Continued)	3
10	Advances in boiling heat transfer	3
11	Advances in condensation heat transfer	3
12	Advances in heat exchanger design	3
13	Advances in heat exchanger design (continued)	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 2.1.2 2.1.4 2.1.7	Modified lectures	Individual coursework assignments, quizzes, oral discussions and reports. Mid-term and /or final written examination is given.
2.2.1 2.2.3 2.2.5 2.2.8 2.2.11	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.
2.3.1 2.3.3 2.3.6	Software demonstrations	Coursework exercises and reports, project reports and presentations.
2.4.1 2.4.4 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, 2, 3, 4, 6,9 and 13
Assessment 2	Quizzes	on weeks	5, 10
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

- Yunus A. Cengel and Afshin J. Ghajar, Heat and Mass Transfer: Fundamentals and Applications, 5/e, McGraw-Hill, Inc., 2015.
- Latif M. Jiji, "Heat Conduction", Springer, 2009.
- Latif M. Jiji, "Heat Convection", Springer, 2006.

7.2 websites

- www.4shared.com
- www.sciencedirect.com

8- Facilities required for teaching and learning

Presentation board, computer and data show
Laboratory

Course coordinator: Prof. Dr. Karam El-Shazly
Course instructor: Prof. Dr. Karam El-Shazly, Prof. Dr. Sherif Taher, Prof. Dr. Ramadan Sakr

Head of Department: Prof. Dr. Osama Ezzat

Matrix of course content and ILO's

Course Title: **Selected Topics in Heat Transfer** **Code**: **MEP701**
Lecture: 3. **Tutorial**: ---- **Practical**: ---- **Total:** 3
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Course content	ILO's A	ILO's B	ILO's C	ILO's D
Advanced topics in steady state conduction heat transfer	a2	b1	c1	d1
Advanced topics in transient conduction heat transfer	a2	b1,b2,b5	c1	d2
Differential formulation of the basic laws governing convection and inegral solution for 1-D	a2	b1	c2	d2
Advanced topics in heat transfer for external flow	a1,a2	b1,b4,b5	c2	d2
Advanced topics in heat transfer for external flow (Continued)	a1,a2	b1,b2,b4	c2	d2,d3
Advanced topics in heat transfer for internal flow	a1,a2	b1,b2,b4	c2	d2
Advanced topics in natural convection	a2	b1,b4,b5	c2	d2
Advanced topics in natural convection (Continued)	a2	b1,b2,b4	c2,c3	d2,d3
Advances in boiling heat transfer	a1,a2	b1,b2,b3,b4	c2,c3	d2,d4
Advances in condensation heat transfer	a1,a2	b1,b2,b3,b4	c2,c3	d2,d4
Advances in heat exchanger design	a1,a3	b1,b2,b3,b4	c2,c3	d2,d3
Advances in heat exchanger design (continued)	a1,a3	b1,b2,b3,b4	c2,c3	d2,d3

Matrix of course aims and ILO's

Course Title: **Selected Topics in Heat Transfer** **Code**: **MEP701**
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Course aims	ILO's A	ILO's B	ILO's C	ILO's D
1-Produce and develop advanced researches in different topics of heat transfer applications.	a1,a2,a4	b2,b5	c1,c2	d1
2- Use software related to heat transfer problems.	a2	b1,b4	c1,c2	d3,d4
3- Solve heat transfer problems in different applications.	a1,a2	b1,b4	c1,c2	d2,d3
4- Design computer programs to solve heat transfer applications.	a2,a4	b1,b4	c1,c2	d3,d4
5- Design heat transfer equipment.	a1,a2,a3	b3	c1,c2,c3	d3