Part G-1: Course Specifications

University Cairo University
Faulty of Engineering
Mechanical Power Engineering Department
Course Specifications

Program(s) on which the course is given:	M.Sc. Prerequisites.
Major or minor element of programs:	Heat Transfer and its Applications
Department offering the program:	Mechanical Power Engineering Department
Department offering the course:	Mechanical Power Engineering Department
Academic year /level:	First year in M.Sc. / Level 6

Date of specification approval:

A. Basic Information

Title:	Electronics Cooling
Code:	MPE 635
Credit hours:	2/Term but teaching covers the full year (2 terms)
Lectures:	20
Tutorial:	6
Practicals:	4
Total:	30

B. Professional Information

1. Overall Aims of Course

The course aims to expand the scope of the mechanical engineer to include the importance of effective heat transfer in electronic equipments. This should include the heat transfer processes occurring in electronic equipment, the methods of packaging and cooling and finally the analysis of thermal failure for electronic components.

2. Intended Learning Outcomes of course (ILOs)

a- Knowledge and Understanding:

Heat transfer processes involved in electronics cooling.
Thermal design of electronic packages.

b- Intellectual Skills

Analysis of thermal failure for electronic components and define the solution.

c- Professional and Practical Skills

Assigning the best cooling method for each individual application.
Design of cooling system for any electronic device.
Best packaging approach for any design.

d- General and Transferable skills

Heat transfer basics.

Numerical simulation of heat transfer problems.

3. Contents

Topic	No. of Hours	No. of Lectures	Tutorial /Practical
Part A: Introduction to Electronics Cooling	6	2	1
Part B: Heat Transfer Principals in Electronics Cooling	18	8	1
Part C: Electronics Cooling Methods in Industry	16	7	1
Part D: Packaging of Electronic Equipments	8	2	2
Part E: Analysis of Thermal Failure of Electronic Components	6	1	2
Part F: Practical Applications	4	0	2
Electronics Cooling Survey	2	0	1
Total	**60**	**20**	**10**

4. Teaching and Learning Methods

4.1 Lectures, including slide show and power point presentations

4.2 Case studies ended by discussions

4.3 Tutorial and Practice classes for problems answer.

4.4 Laboratory work and reports

5. Student Assessment Methods

No.	Assessment type	Objective
1	Semester Work	in class performance and attendance
2	Other types of assessment (Reports, Quizzes, ..)	student's performance with time
3	Mid-Term Examination	to assess student's performance and to give him feed back
4	Oral Examination	to assess student's performance and communication skills
5	Practical Examination (case studies, …)	intellectual skills and team performance
6	Final-Term Examination	to assess overall student's performance

Assessment Schedule

Assessment 1: week (all over the year)
Assessment 2: week (all over the year)
Assessment 3: week #15
Assessment 4: week #20
Assessment 5: week #25
Assessment 6: week #30

Weighting of Assessments

Semester Work	10%
Other types of assessment	5%
Mid-Term Examination	10%
Oral Examination	5%
Practical Examination	10%
Final-Term Examination	60%
Total	**100%**

6. List of References

6.1. Course Notes

1- Lecture notes developed by the course coordinator
2- Thermal design of electronic packages, a Graduate Course by Prof. Kamal-Eldin Hassan.

6.2. Essential Books (Text Books)

1. Dave S. Steinberg," Cooling Techniques for Electronic Equipment ", Second Edition, John Wiley & Sons, 1991.
2. Frank P. Incropera, "Introduction to Heat Transfer ", Fourth Edition, John Wiley, 2002.
3. Sung Jin Kim and Sang Woo Lee, "Air cooling Technology for Electronic Equipment", CRC press, London, 1996.
4. Frank P. Incropera, "Liquid Cooling of Electronic Devices by Single-Phase Convection", John Wiley& sons, inc, 1999.

5. Charles A. Harper," Electronic Packaging and Interconnection Hand Book ", Second Edition, McGraw-Hill, 1997.

6.3. Recommended Books

6. Joel L. Sloan, "Design and Packaging of Electronic Equipment", Van Nostrand Reinhold Company, 1985.
7. Belady C., "Standardizing Heat Sink Performance for Forced Convection, Electronics Cooling", Vol. 3, No. 3, September, 1997.
8. Biber C., Wakefield Engineering, Wakefield, Massachusetts, "Characterization of the Performance of Heat Sinks,", Personal Communication, October 1997.
9. Butterbaugh M.A. and Kang S.S., IBM, Rochester, Minnesota, "Effect of Airflow Bypass on the Performance of Heat Sinks in Electronic Cooling," Presented at the ASME Winter Annual Meeting, 1995.

6.4. Periodicals, Web Sites, … etc

http://www.electronics-cooling.com
http://www.me.umn.edu/courses/me5348/index.html
http://www.acktechnology.com/Application%20Notes.htm
http://www.melcor.com/index.html
http://home.socal.rr.com/xsvtoys/articles.htm
http://www.nidec.com/aircooling/fantech.htm
http://www.ferrotec.com/usa/index.html
http://www.desernet.com
http://www.thermalloy.com/catalog/htm/geninfo.htm
http://www.coolingzone.com/Content/SupplierDirectory/index.html
http://www.thermalcooling.com/courses/instrnf.htm
http://www.thermalcomputations.com/#A
http://www.technicalbooks.net/Merchant2/merchant.mv?Screen=PLST&Store_Code=1

7. Facilities Required for Teaching and Learning

Lecture room for 20 students, accommodated with visual aids and data show
Electronic Packaging and Cooling Lab.

Course Coordinator:
Dr. Sayed Kasseb,
Dr. Gamal Al-Hariry

Head of Department:
Prof. Dr. Zeinab Safar

Date: 30/4/2006