
Part G-5: Contents of Courses and Books

Contents of National and International Courses and Books

A. Contents of National and International Courses

University or web site	Course title	Course number	Lecturers	Content
Auburn university	Heat transfer in electronic equipment	ME5348	A.D. Kraus and A. Bar-Cohen	<p>Introduction to Thermal/Fluid Issues in Electronics Manufacturing and Assembly</p> <p>Conduction in Printed Circuit Boards and Chip Packages</p> <p>Natural Convection Cooling of Electronic Systems</p> <p>Forced Convection from Printed Circuit Boards</p> <p>Design & Optimization of Single Fins</p> <p>Heat Sinks</p> <p>Introduction to Boiling and Condensation</p> <p>Passive Immersion Cooling</p> <p>Compact Models of Chip Packages and Heat Sinks</p> <p>Failures and Reliability</p> <p>Strain, Stress, and Fatigue</p> <p>Thermoelectric Cooling</p> <p>Heat Pipes</p>

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<p>www.engr.sjsu.edu/ckomives/Courses/Heat%20Transfer%20in%20Electronics/index.htm</p>	<p>Heat transfer in electronics</p>	<p>CHE/ME 109</p>	<p>Dr. Claire F. Komives</p>	<p>Introduction: importance of heat transfer Basic of heat transfer Heat transfer mechanism General 1-D conduction General 3-D conduction Heat generation and variable thermal conductivity & Solution of conduction problems Steady state 1-D conduction Heat transfer from finned surfaces Transient conduction - lumped system analysis 1-D Transient conduction Introduction to forced convection Natural convection over surfaces Natural convection from finned surfaces and PCB's Combined natural and forced convection Thermal radiation</p>
<p>The State University of New Jersey-Science and Engineering Resource Center</p>	<p>Mechanical engineering aspects of electronic cooling</p>	<p>14: 650: 478</p>	<p>Dr. L. S. saxena</p>	<p>Communications/Information industry overview Convergence of telephone, computer, entertainment Communications networks and technologies Traditional telephone, voice & data, LANs, WANs, Internet, IP OSI layers, the physical layer and opto-electronic packaging hierarchy Semiconductors and integrated circuits Integrated circuit packaging Printed circuit boards, backplanes, cabinets, connectors, cables Optical and electronic components Electronic materials Thermal management Thermal design & analysis, free and forced air-cooling etc. Electrical design considerations Parasitics, EMC/EMI etc. Product development and manufacturing Reliability, qualification, environmental stress testing Failure modes, shock & vibration, thermo-mechanical stresses, corrosion etc. Quality standards, ISO 9000 Industrial ecology and design for environment, ISO 14000</p>

Part G-5: Contents of Courses and Books

<p>University of Oslo</p>	<p>Electronic components, packaging and product</p>	<p>ISBN 82-992193-2-9</p>	<p>Leif Halbo and Per Ohlckers</p>	<p>Introduction to electronic products and electronic packaging Technologies for electronics-overview Materials and basic processes Components for electronic systems Printed wiring board PCB design Production of PCB Hybrid technology and multi ship modules Micro structure technology and micro machined devices</p>
<p>Portland State University</p>	<p>Heat Sinks for Electronic Cooling Applications</p>	<p>ME 449/549</p>	<p>Gerald Recktenwald Associate Professor, Mechanical Engineering Department</p>	<p>What is a Heat Sink? Types of Heat Sinks Simple Model of a Component with a Heat Sink Review of Fin Theory Characterization Experiments: measuring thermal resistance Empirical Data on Heat Sinks</p>

Part G-5: Contents of Courses and Books

Cairo University	Univ. of Minnesota & Innovative Research, Inc.	Thermal Design of Electronic Packaging	System-Level Thermal Design for Electronics Cooling	Dr. Kamal-Eldien Hassan	Dr. Suhas Patankar	<p>Importance of thermal design. Board-level and system-level design. Available software tools for board-level analysis. Computational Fluid Dynamics (CFD). Software tools for CFD. Mass and momentum conservation. Pressure drop and flow resistance. Fan curves. Heat transfer coefficients. Representation of cooling systems as flow networks. Flow resistances for common components.</p> <p>Introduction Review of basic principles Packaging of electronic systems Analogy between electric and thermal circuits Thermal networks Thermal contact resistance Heat exchangers Forced air cooling Design for transient conduction</p>
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B. Contents International References

Book Title	Authors	Publisher	Contents
Cooling techniques for electronic equipment	Dave S. Steinberg	1991 by John Wiley & Sons	<ul style="list-style-type: none"> • Evaluating the cooling requirements • Designing the electronic chassis • Conduction cooling for chassis and circuit boards • Mounting and cooling techniques for electronic components • Practical guides for natural convection and radiation cooling • Forced air cooling for electronics • Thermal stresses in lead wires, solder joints, and plated through holes • Predicting the fatigue life in thermal cycling and vibration environments • Transient cooling for electronic systems • Effective cooling for large racks and cabinets • Finite element methods for mathematical modeling • Environmental stress screening techniques
Electronic packaging and interconnection hand book	Charles A. Harper	1997 by McGraw-Hill	<p>Materials for electronic packaging Thermal management Connector and interconnection technology Wiring and cabling for electronic packaging Solder technologies for electronic packaging Packaging and interconnection of integrated circuits The hybrid microelectronics technology Rigid and flexible printed wiring boards Surface mount technology Advanced electronic packaging Packaging of high speed and microwave electronic systems Packaging of high voltage systems</p>

Part G-5: Contents of Courses and Books

Design and packaging of electronic equipment	Joel L. Sloan	1985 by Van Nostrand Reinhold Company	<p>Factors influence equipment design Cooling techniques Mechanics of conduction Mechanics of convection and radiation Thermal elastic effects Force systems in electronic equipment Displacement and stresses in equipment Dynamic characteristics of electronic equipment</p>
Heat transfer	J. P. Holman	1997 by McGraw-Hill	<p>Introduction to heat transfer Steady state conduction-one dimension Steady state conduction-multiple dimension Unsteady state conduction Principles of convection Empirical and practical relation for forced convection heat transfer Natural convection systems Radiation heat transfer Condensation and boiling heat transfer Heat exchangers Mass transfer</p>

Part G-5: Contents of Courses and Books

<p>Introduction to heat transfer</p>	<p>Frank P. Incropera, and David P. Dewitt</p>	<p>2002 by John Wiley & Sons</p>	<p>Introduction to heat transfer Introduction to conduction One dimensional, steady state conduction Two dimensional, steady state conduction Transient conduction Introduction to convection External flow Internal flow Free convection Boiling and condensation Heat exchangers Radiation</p>
<p>Heat transfer text book</p>	<p>John H. Lienhard IV and John H. Lienhard V</p>	<p>2001 by John H. Lienhard IV and John H. Lienhard V</p>	<p>Introduction to heat transfer Analysis of heat conduction Convective heat transfer Heat exchanger design Thermal radiation heat transfer Mass transfer</p>

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<p>Mechanical Engineering Hand book</p>	<p>Ed. Frank Kreith</p>	<p>1999 by Boca Raton</p>	<p>Engineering thermodynamics Fluid mechanics Heat and mass transfer Electrical engineering Electronic packaging</p>
<p>Thermal Management of Microelectronic Equipment</p>	<p>L-T Yeh and R. C. Chu</p>	<p>American Society Of Mechanical engineering 2003</p>	<p>Heat transfer modes thermal interface resistances printed circuit boards air cooling and fans heat exchangers thermoelectric coolers</p>

C. Contents of Books Available in FECU Library

1. Sung Jin Kim and Sang Woo Lee, "Air cooling Technology for Electronic Equipment", CRC press, London, 1996.

Contents:

- Geometric Optimization of Cooling Techniques
- Entrance Design Correlations for Circuit Boards in Forced-Air Cooling
- Forced Air Cooling of Low-Profile Package Arrays
- Conjugate Heat Transfer in Forced Air Cooling of Electronic Components
- Enhancement Air Cooling of Electronic Equipment
- Limits of Air Cooling –A Methodical Approach

2. Jerry E. Sergeant Al Krum, "Thermal Management for Electronic Assemblies", McGraw-Hill London, 1998.

Contents:

- Introduction
- Thermal Effects on Electronic Circuits
- Thermal Properties of Electronic Material
- Heat Generation in Electronic Circuits
- Basic Thermal Analysis
- Computer-Based Thermal Analysis
- Thermal Management
- Electronic Device Cooling

3. Frank P. Incropera, "Liquid Cooling of Electronic Devices by Single-Phase Convection", John Wiley & sons, inc, 1999.

Contents:

- Introduction
- Fundamentals of Heat Transfer and fluid Flow
- Natural Convection
- Channel Flows
- Jet Impingement Cooling
- Heat Transfer Enhancement

4. Roger vizi, "Forced Hot Air Furnaces, Troubleshooting and Repair", mcgraw-Hill, London, 1999.

Contents:

- Introduction
- Listing and Observing
- Components of a Gas Forced Air Heating System
- Electric Circuits
- Operation of a Gas Forced Air Heating System
- Tuning up a Gas Forced Air Heating System
- Troubleshooting a Gas Forced Air Heating System
- Introduction to Humidifiers
- Installation and Maintenance of Humidifiers
- Is an Electronic Air Cleaner Right For You?
- Installation and maintenance of Electronic Air Cleaners
- Introduction to Oil Forced Air Heating Systems
- Electric Circuits for Oil Forced Air Heating Systems
- Protecting Oil Tanks in the Winter
- Operation of an Oil Forced Air Heating Systems
- Tuning Up an Oil Forced Air Heating Systems
- Troubleshooting an Oil Forced Air Heating Systems
- Is Electric Forced Air Heat Right For You?
- Controls for an Electronic Forced Air Heating System
- Circuits for an Electronic Forced Air Heating System
- Operation and Maintenance Electronic Forced Air Heating System
- Troubleshooting Electronic Forced Air Heating System
- Is a Heat Pump Right for You?
- How Does a Heat Pump Work?
- Introduction to Heat Pumps
- Operation and Maintenance of Heat Pumps
- Troubleshooting Heat Pumps