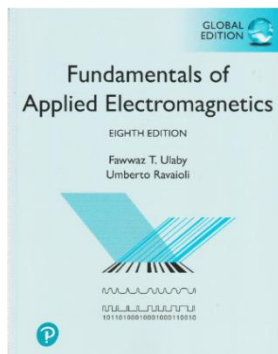


ME1200

Electromagnetic Theory Courseware

Teaching slides - Not Available



We recommend the textbook: “Fundamentals of Applied Electromagnetics, 8th Edition.” By Fawwaz T. Ulaby, Umberto Ravaioli, Published by Pearson.

Note: additional student and instructor resources are at <https://em8e.eecs.umich.edu>

Training kit

- EM hardware kit with synthesized 2.4-2.6 GHz microwave source
- Six editable laboratory sheets with model answers
- Problem-based antenna matching assignment
- Approximately 18 hours of laboratory activities



Target university subject	Target year of study	Prerequisite(s)
Electromagnetic Theory Fields and Waves Transmission Lines	2 nd or 3 rd year undergraduates	Introductory Field Theory Electricity and Magnetism

A practical laboratory platform for guided electromagnetic waves, transmission lines and impedance matching.

ME1200 helps students connect field theory with measurable wave behaviour on an exposed microstrip transmission line. The package combines microwave hardware, structured laboratory activities, model answers and design assignments for second- and third-year engineering courses.

Learning Outcomes

Students would be able to:

- Apply Maxwell's equations to solve applied electromagnetic problems.
- Explain how propagating electromagnetic waves are generated.
- Explain guided time-harmonic wave behaviour on terminated transmission lines.
- Characterize wavelength, standing-wave patterns and reflection behaviour
- Use the Smith Chart to design impedance-matching networks
- Implement and evaluate single-stub impedance-matching schemes

Benefits of the ME1200 courseware

- **From Maxwell's equations to practical RF measurement** - ME1200 is designed around an exposed microstrip transmission line. Students can see the physical structure, move the electric-field probe along the line, and relate measured field intensity to incident waves, reflected waves, standing-wave patterns and load mismatch.
- **Modern RF context** - Microstrip, SMA interfaces and 50 Ω measurement practice connect electromagnetic theory with RF PCBs, wireless systems and microwave engineering.
- **Interactive matching design** - Bundled Smith Chart software supports visual design and analysis of lumped and transmission-line impedance-matching networks.



Teaching Slides

The recommended “Fundamentals of Applied Electromagnetics has been a seminal text in its field for over a decade, acclaimed by learners and teachers alike. This eighth edition builds on the style and legacy of its predecessors by including updated content and features.

The book is also complemented by web-based interactivities that learners can use in conjunction with the material in the book.

Student Resources: Exercise Solutions, Modules, Technology Briefs, Test Your Understanding, Frequency Allocation Chart, Smith Chart

Instructor Resources (requires registration with Pearson: Book Figures and Tables, PPT Slides, Solution Manual



Training Kit

EM Hardware Kit

The hardware kit integrates a synthesized microwave source, a microstrip transmission line mounted on a robust support, and a movable near-field electric probe. Students can measure relative electric-field strength at selected positions along the line.

• Standing-wave observation, Wavelength measurement, Matched and mismatched load comparison, Impedance transformation, Single-stub impedance matching



Termination board tuned at 2500MHz:

1. 50 ohm terminated transmission line
2. 220 ohm terminated transmission line
3. 220 ohm single-stub impedance transformer #1
4. 220 ohm single-stub impedance transformer #2

Accessories

The following accessories are included in the training kit.

Item	Quantity
ME1200 Termination board	1
RF Coaxial cable	1
N(m)-SMA adaptor(f)	1
N(f)-SMA adaptor(f)	1
Male-to-Male SMA adapter	1
50 Ohm coaxial termination	1
Short-circuit coaxial termination	1
USB cable	1
Power adapter, 5 VDC, 1 A	1

Lab sheets

The training kit includes six editable Microsoft Word laboratory sheets. Each activity is designed for approximately three hours, providing about 18 hours of laboratory work. Model answers are supplied for all laboratory sheets.

Lab Sheet	Required Instrument	
	EM Hardware Kit	Power Meter OR Spectrum Analyzer
1. Introduction to EM Waves and Transmission Lines	√	
2. Wave Propagation on a Transmission Line and Standing Wave (SW) Pattern	√	√
3. Introduction to Smith Chart ^[1]		
4. Introduction to the Concept of Impedance Transformation - Design of Lumped Impedance Transformation Network ^[2]		
5. Introduction to Impedance Transformation Using Single-Stub Transmission Line Networks ^[2]	√	√
6. More advanced concepts of impedance transformation - Impedance matching and power transfer, double-stub transmission line networks ^[1] ^[2]	√	√

^[1] Free Smith Chart software will be provided for this lab, i.e., *fSmith*.

^[2] Advanced lab exercises suit students majoring in Telecommunications/Microwave/RF engineering.

Problem-Based Assignments

The problem-based assignment below allows students to enhance their problem-solving skills.

- Design an impedance-matching network for an antenna. Students apply transmission-line and Smith Chart concepts to a practical RF design problem, reinforcing analysis, design justification and engineering problem-solving skills.



Instruments

The recommended instruments to be purchased separately are listed below.

Instrument / Software ^[1]	Model
Power Sensor	Minimum 3 GHz Power Meter & Sensor
Spectrum Analyzer [preferred] ^[2]	Minimum 3 GHz RF Spectrum Analyzer

^[1] Refer to the Lab sheets section for the instrument selection.

^[2] These instruments are also recommended for the ME1000, ME1020, and ME1400. It can lock on the frequency of interest and make the power measurement.

Training Kit Hardware Specifications

EM Hardware Kit

RF

Microwave source output power	0 ±1 dBm
Microwave source output frequency (3 fixed points)	2.435, 2.500 & 2.585 GHz
Microwave source output frequency accuracy	±2 MHz

General

Input voltage	5.0 V (min) 6.0 V (max)
Input current	30 mA (typical)
EMC designed to	IEC61326-1:2005 / EN61326-1:2006 CISPR11:2003/EN55011:2007 Group 1, Class A
Warranty	1 year

Ordering Information

Description	Package	Product Number
Teaching Slides Training Kit	Not available 1 set	Purchase the textbook separately ME1200-200
Teaching Slides + Training Kit	Not available	
Instruments	Where applicable	Purchase separately

Training courses related to subject matter are available on request. Visit dreamcatcher.asia for details.

For more information or enquiries:

Website: dreamcatcher.asia/cw
E-mail: cw.sales@dreamcatcher.asia

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