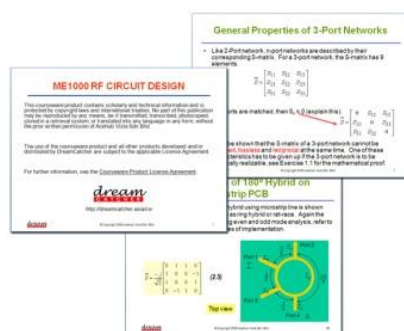


ME1020

RF Principles & Measurements Courseware

Teaching slides

- Editable Microsoft® PowerPoint® slides
- Covers 45 hours of teaching



Training kit

- RF transceiver kit & accessories
- Lab sheets & model answers
- Problem-based assignments
- Covers 27 hours of labs



Target university subject	Target year of study	Prerequisite(s)
RF Engineering, RF Principles and Applications, RF Communications, RF Test & Measurement	2 nd / 3 rd year Diploma Program and 1 st / 2 nd year Undergraduate	Circuit Theory Field Theory

The ME1020 is a ready-to-teach package in RF Principles, Test and measurement, and RF Communications. This lecturer resource consists of teaching slides, training kits, lab sheets, and problem-based assignments.

Learning Outcomes

Upon completion of this course, students would be able to:

- Apply RF principles to the analysis of RF devices
- Evaluate specifications of RF devices
- Perform RF measurements using a vector network analyzer and spectrum analyzer
- Troubleshooting the RF transceiver at the circuit level
- Apply calibration method to improve measurement accuracy

Benefits of the ME1020 courseware

- A practical hands-on approach to learning RF spectrum analysis and vector network analysis using industry-grade RF spectrum analyzer and vector network analyzer.
- Hands-on exercise on calibration methods and instrument setting optimization to improve RF measurement accuracy.
- The RF transceiver kit is not a “black box”; it consists of modularized transmitter and receiver units, providing the flexibility to measure and analyze individual building blocks for developing troubleshooting skills.
- The modular structure of the transceiver kit allows students to appreciate how a few building blocks work together as a subsystem, hence increasing the educational value of the transceiver kit.





Teaching Slides

More than 400 editable Microsoft PowerPoint teaching slides are provided, covering 45 hours of teaching for one semester. The slides cover the following topics:

- Basic RF/Microwave Concepts
- Transmission Lines and Impedance Matching
- Printed Circuit Boards (PCBs) and RF
- RF Test Bench Accessories
- Popular RF Instruments (SA, VNA & PM) and Measurement Error Correction
- Basics of Antennas and Radio Propagation
- Overview of Transceiver Architectures
- Filter Function and Measurements
- Low Noise Amplifier Function and Measurements
- Power Amplifier Function and Measurements
- RF Oscillator Function and Measurements
- Mixer Function and Measurements



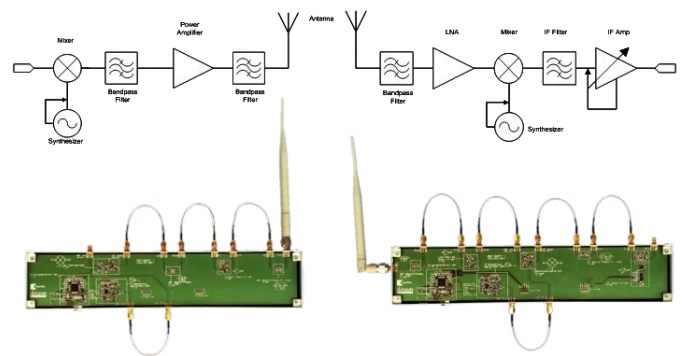
Training Kit

ME1000 RF transceiver kit^[1]

The RF transceiver kit consists of a transmitter unit and a receiver unit in superheterodyne architecture. The transceiver units are made up of various RF building-block modules such as filter, low noise amplifier, power amplifier, mixer and oscillator.

The RF transceiver kit is controlled by a Windows®-based Control Panel software via USB. A Measurement Automation Program is provided to demonstrate automated characterization and test of RF circuits. A signal generator and a spectrum analyzer are required to run this program.

[1] The same RF transceiver kit is used in ME1000 courseware



Accessories

The following accessories are provided with the training kit.

Item	Quantity
TRM standard calibration kit	1
USB cable	3
SMA(m)-to-SMA(m) jumper cable, 0.18 m	9
SMA(m)-to-SMA(m) coaxial cable, 1 m	2
N(m)-to-SMA(f) adapter	2
RF power combiner	1
Antenna	2
Ground cable, 1 m	2



Note: A PC with Windows® 10 or 11 is required to operate the Control Panel software for controlling the RF transceiver kit.



Lab sheets

The training kit includes 8 lab sheets in editable Microsoft® Word format. Each lab requires 3 hours to complete. Model answers are provided with all lab sheets. The required instruments for the labs are listed below.

Lab sheet titles	Option 1 RF Signal Generator & Spectrum Analyzer	Option 2 Vector Network Analyzer
1. Vector network analysis - understanding s-parameter measurements		√
2. Vector network analysis - calibration and shifting of reference planes through a port extension		√
3. Vector network analysis of RF Filter - transmission, reflection, impedance on Smith Chart		√
4. Vector network analysis of Amplifier - gain, isolation, gain compression, AM-PM conversion		√
5. Spectrum analysis - understanding Spectrum Analyzer settings	√	
6. Spectrum analysis of Frequency Synthesizer and Mixer - harmonics, intermodulation, isolation	√	
7. Analyzing Amplifier using Spectrum Analyzer- gain, compression, harmonics, and isolation	√	
8. Measurement and troubleshooting of RF Transceiver	√	
9. Vector network & Spectrum analysis of RF Divider/Combiner - insertion loss, return loss.	√	√

Problem-based assignments

The problem-based assignments below allow students to enhance their problem-solving skills.

1. Study on Image Frequency Rejection
2. Analysis of the Channel Bandwidth of an RF Transceiver
3. RF Signal Attenuation Through a Human Body



Instruments

The recommended instruments and software from Keysight Technologies, to be purchased separately, are listed below.

Instrument / Software ^[1]	Model
RF Signal Generator	Minimum specification: Operating Frequency up to 1 GHz
RF Spectrum Analyzer	Minimum specification: Operating Frequency up to 3 GHz
Vector Network Analyzer	Minimum specification: S-parameters measurements up to 1 GHz
Calibration Kit (optional)	Standard Mechanical Calibration Kit, DC to 9 GHz, 3.5 mm

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



Training Kit Hardware Specifications


	RF Transmitter Unit	RF Receiver Unit
RF		
Frequency synthesizer output power	-4.5 dBm (typical)	
Frequency synthesizer frequency range	816 MHz to 880 MHz	816 MHz to 880 MHz
Antenna frequency range	806 MHz to 960 MHz	806 MHz to 960 MHz
Antenna length	210 mm	210 mm
General		
Power source		USB
EMC designed to		Class B, Part 15 of FCC
Warranty		1 year

Ordering Information

Description	Package	Product Number
Teaching Slides	1 user license	ME1020-100
Training Kit (same HW kit as in ME1000)	1 set	ME1020-200 (non-instrument-brand dependent lab sheets)
Training Kit Without bundled HW kit	20 licenses (1 copy per lab station)	ME1020-210
Teaching Slides + Training Kit	1 user license + 1 set	ME1020-300
Instruments	where applicable	Purchase separately

Note: Pictures in this document are for illustration purposes only and may differ from the actual product.

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

<p>For more information or inquiries:</p> <p>Website: dreamcatcher.asia/cw E-mail: cw.sales@dreamcatcher.asia</p> <p>Acehub Vista Sdn Bhd (785702-P) (the legal entity of the University Courseware business)</p> <p>70-03-79, D'Piazza Mall, Jalan Mahsuri 11900 Bayan Lepas, Penang Malaysia</p>	<p>© 2010-2013 Acehub Vista Sdn Bhd</p> <p>We reserve the right to change or alter the information in this material without prior notice. The information provided in this material is accurate as of the print date.</p> <p>Microsoft, Windows, and Office Programs are trademarks of Microsoft Corporation in the United States and/or other countries. All other copyrights and trademarks belong to their respective owners.</p> <p>Updated on 6th August 2023</p> <p></p>
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