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# Introduction to Electronic Theory

## Course No. 103 (formerly 104-2)

### Course Outline

**FOR WHOM INTENDED** This course is intended for individuals whose primary formal training is not in the field of electronic engineering. Electrical controls and electronics are incorporated in almost every technical activity, and all technical personnel have to deal with some aspects of electronics. A basic understanding of electronics is essential to better perform their main function.

**OBJECTIVES** To help participants to understand the concepts and terminology of electronics. It is not an in-depth electronics course but rather a course aimed at individuals who require an intensive review of basic principals, without the assumption of any prior knowledge of the topic. The course is fast paced and as non-mathematical as possible.

**BRIEF COURSE DESCRIPTION** The course begins with the concept of an electrical circuit, with an example. A brief review of related mathematics follows, including vectors, phasors, RMS and scientific and engineering notation. The course covers basic concepts of electrical theory, starting with the simple DC circuit and Ohm's Law. Sinusoidal and non-sinusoidal waveforms are discussed as they apply to electrical technology.

The course then describes the basic components encountered in electrical circuits, such as resistors, capacitors, inductors etc. The course discusses behavior of inductors and gives examples of circuit theory, including LCR circuits and filters, also transient RL circuit analysis. Resonant circuits and their applications are covered. The basic theory of transformers and their various types: power, current, potential and transformers used in measurement systems are discussed, as are rectifier and filter circuits.

Moving from electricity to basic electronics, we cover the theory of solid-state electronics, including semiconductor physics, diodes and transistors. The course presents amplifiers, including various applications of power amplifiers, negative feedback etc. This leads to the study of oscillators and digital logic circuits.

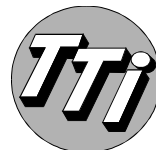
**RELATED COURSES** This course is related to TTI's courses 104-3 and 104-5, which satisfy the 104 requirement for TTI's [Dynamic Test Specialist \(DTS\)](#), [Electronic Telecommunications Specialist \(ETS\)](#), [Mechanical Design Specialist \(MDS\)](#) and [Instrumentation Test Specialist \(ITS\)](#) Diploma Programs. Course 103 may be used as an *optional course* for any TTI Specialist Diploma Program for which course 104 is not required. Any TTI course may be presented at your facility.

**PREREQUISITES:** An understanding of basic algebra will be useful. This course is meant for individuals working in a technical field other than electronics.

**TEXT** Participants receive a [course workbook](#), which contains most of the viewgraphs used during the presentation.

**COURSE HOURS, CERTIFICATE AND CEUs** Open courses meet seven hours per day. Upcoming presentation dates can be found on our current [open course schedule](#). Class hours/days for on-site courses can vary from 14–35 hours over 2–5 days as requested by our clients. Upon successful course completion, each participant receives a certificate of completion and one Continuing Education Unit (CEU) for every ten class hours.

Introduction: Review of a typical electronic circuit  
Schematic of a Radio Receiver • Electronic Symbols and Abbreviations  
Path of Signals through Circuit • Block Diagram  
Mathematical Fundamentals • Scientific and Engineering Notation  
Radians • Vectors • Angular Frequency • Phase • Complex Algebra  
Electrical Fundamentals Review: Electrostatic Field and Potentials  
Charge • Conductors, Insulators • Current, Voltage • Ohm's Law  
EMFs in Series and Parallel • Resistors • Series Circuits  
Network Laws: Kirchhoff's Laws • Thevenin's and Norton's Theorems  
Alternating Current • Sine and Non-sine Waveforms • Square Wave  
Pulse Shape of Square Wave • Complex Waveform • Harmonics  
Digital vs. Analog Waveforms • Unwanted Digital Signals  
Examples: Parallel Circuits • Conductance • DC Series-Parallel circuits  
Thevenin's Theorem • Effective or rms Value of Current or power  
Addition of Sine Waves  
Capacitors and Inductors: Capacitors in DC circuits • Capacitance  
Capacitors in Parallel and in Series • Inductance • Mutual Inductance  
Inductors in Series and Parallel  
Transient RC and RL Circuits: RC and RL Time Constants  
Examples: RC Time Constant • RL Time Constant  
Current Fall in an Inductor • Change in Voltage  
Reactance, Impedance in AC Circuits: Capacitive, Inductive Reactance  
Impedance Triangle • Impedances of a Reactive AC Circuit  
Inductive and Capacitive Reactance in an AC Circuit  
Reactance in Series AC Circuits: RL, RC, RLC  
Impedances in Series or Parallel • Parallel Reactance • Examples  
Series and Parallel Resonance: Resonant Frequency  
Q of a Series Circuit • Bandwidth of Series R-L-C Circuit • Example  
Parallel Resonance • Band-pass and Band-stop Filters  
Transformers: Equivalent Circuit • Turns Ratio  
Power Relationships, Efficiency • Impedance Matching  
Transformers: Loosely coupled, Single and Double Tuned  
Local Power Distribution Systems • Voltage Transformations  
Rectifiers and Filters: Power Supply with Regulator  
Half and Full Wave Rectification • Bridge Rectifier • Filters  
Capacitive Load • Power Supply Loading • Filter Choke  
Semiconductor Physics: N-type and P-type Doping • Diffusion  
Diodes, Transistors and Biasing: Alloy Junction Diode  
Planar Technology (Diffusing) • P-N Junction Behavior • Junction Barrier  
Transistors and Biasing • How transistors amplify • NPN Transistor  
Amplifier Gain • Common Base, Emitter, Collector Circuits  
Amplifier Fundamentals and Considerations: How Transistors Amplify  
Transistor voltage, Power Gain and Operating Point  
Base Bias Adjustment • Signal Clipping • Classes of Operation  
Coupling Methods • Frequency Response • Distortion • Slewing Rate  
Tuned Amplifiers, Oscillators and Feedback: AM and FM IF Bandwidths  
IF Amplifier Stage • Detector and AGC Circuit • Oscillators  
Kinds of Oscillators • RC Oscillators • Feedback • Negative Feedback  
Differential and Operational Amplifiers: One Input • Two Inputs  
Common Mode Rejection • Op Amp characteristics  
Mini-DIP Integrated Circuit • Rules for External Feedback Op Amps  
Op Amp Circuits: Inverting or Noninverting Amplifier • Follower  
Basic Cautions • Applications  
Digital Logic Functions: Logic Gates  
Inverter, AND, OR, NAND, NOR, XNOR, XOR  
Summary, Discussion • Final quiz  
Award of Certificates for Successful Completion



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