

Veer Narmad South Gujarat University, Surat  
Syllabus for: Electronics for F Y B Sc (Electronics)  
Semester- 1 (With effect from June 2011)  
PAPER I: Basic Electrical Circuits

**[3 credit course- 3 hours per week]**

**Unit I:** DC and AC Circuits [8 hrs]

Coulomb's law, moving charges, current drift velocity, source voltage & load current, Ohm's law, resistivity, Temperature dependence, non ohmic conductors

Alternating current & voltages, frequency & period, Types of waves, reference circle, phase angle and phase difference, average and r.m.s value, reactance and impedance

**Unit II:** Basic Laws of Electrical Science [15 hrs]

Voltage drop, series and parallel circuit, Kirchhoff's Voltage Law, Kirchhoff's Current Law, applications of KVL, KCL, voltage division rule, current division rule, Super position theorem, concept of ideal voltage source and constant current source, Thevenin's Theorem, Norton's theorem, Maximum power transfer theorem, applications.

Network, mesh and node variable analysis, T and  $\Pi$  conversion, reciprocity theorem, compensation theorem, Tellegen's theorem, Millman's theorem, applications.

**Unit III:** Passive Devices [15 hrs]

Resistors, Fixed resistors & variable resistors, Color code, Power ratings, Temperature coefficient, NTC & PTC, Potentiometers and Presets

Capacitors, dielectric and dielectric constant, construction and working, capacity of a capacitor, Non-polar and Polar capacitors, specifications

Inductors, construction, types and uses

Transformer Construction and working, transformer core materials, characteristics of power transformer & audio transformer, transformer symbol, auto transformer

Mechanical switches, poles and throws, SPDT, DPDT, push to on, push to off, multiple way switches, electromagnetic switch (relay), construction and working, types of electromechanical relay.

Reference Books:

1. Fundamentals of Electrical Engg and Electronics by B L Theraja,
2. Basic Electronics by Grob
3. Fundamentals of Electric Ckts by Samuel Oppenheimer
4. Electronic Components and Materials by S M DHIR

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PAPER II: Network Analysis and Filters

**[3 credit course- 3 hours per week]**

**Unit I:** Laplace Transforms and its applications [12 hrs]

Laplace transform, Laplace transform of various mathematical functions and unit step function, Laplace transform of integration and differentiation inverse Laplace transform, use of Laplace transform in analyzing simple networks, Laplace transform, step response of RC, RL and RLC circuits.

**Unit II:** Sinusoidal function [12 hrs]

Sinusoidal functions, average and effective value, average power, phasor representation, sinusoidal steady state response of R, C, L, RL and RLC circuits, Three phase systems, balanced three phase current and voltage, power in three phase systems.

Fourier theorem, Fourier series, Fourier coefficients, an example

Concept of port, one port and two port network functions, poles and zeros.

**Unit III:** Network analysis and Filters [14 hrs]

Resonance, Q factor, series resonance and bandwidth, parallel resonance and bandwidth, reactance curve, image impedance,

Filter fundamentals, cutoff frequency, pass band and stop band, high pass filters, low pass filters, band pass filters, band reject filters, notch filter, frequency response and characteristic impedance.

Reference Books:

1. Basic Electronics by B L Theraja
2. Electrical Engg Fundamentals by Del Toro
3. Fundamentals of Electric Ckts by Sammuel Oppenheime

**List of Experiments / Laboratory work for Semester-1 (Paper –I & II)**

1. Charging and discharging of capacitor through RC
2. Study of KVL.
3. Study of KCL.
4. Verification of Norton's theorem.
5. Study of Thevenin's theorem.
6. Study of Superposition theorem.
7. Study of series resonance and its bandwidth Q.
8. Study of Parallel resonance and its bandwidth and Q.
9. Study of low pass T filter circuit.
10. Study of low pass n filter circuit.
11. Study of high pass T filter circuit.
12. Study of high pass n filter circuit.

Veer Narmad South Gujarat University, Surat  
Syllabus for: Electronics for F Y B Sc (Electronics)  
Semester- 2 (With effect from June 2011)  
PAPER I: Semiconductor Devices

**[3 credit course- 3 hours per week]**

**Unit I:** Semiconductors and Diodes [10 hrs]

Energy band diagrams, classification of Solids, intrinsic semiconductor, energy band diagram of Semiconductors, free charge carriers, electrons, holes, Fermi level, extrinsic semiconductor, P-type , N-type, majority & minority carriers, formation of PN Junction, charge depletion region, pn junction in equilibrium, forward bias, reverse bias, diode characteristics, diode equation.

Breakdown in diodes, zener breakdown, avalanche breakdown

**Unit II:** BJT [15 hrs]

Construction of BJT, fundamentals of BJT operation, transistor current components, PNP and NPN devices, CE, CC & CB configurations transistor characteristics transistor biasing, DC load line for CE configuration, operating point, cutoff region and saturation region, active region, transistor action,. Gain of a transistor common emitter current gain  $\beta$ , common base current gain  $\alpha$ , their inter relationship, leakage current in transistor, its effect on the operating point, BJT as a switch.

**Unit III:** Other Semiconductor devices [12 hrs]

Comparison of JFET and BJT, advantage of Unipolar device, Construction of FET, characteristic curve of JFET, MOSFET construction, Principle and operation, MOSFET and Enhance only MOSFET and their I-V characteristics, Handling and its gate protection.

Construction & working of UJT, equivalent circuit, intrinsic standoff ratio, Application of UJT as relaxation oscillator.

Direct band gap and indirect band gap semiconductors, LED, Photo diode, photo transistor, Solar Cell, opto couplers and opto isolators.

Reference Books:

1. Basic Electronics by B L Theraja
2. Electrical Engg Fundamentals by Del Toro
3. Electronic Devices and Circuits Allen Mottershead
4. Networks Lines and Fields by J D Ryder
5. Fundamentals of Electric Ckts by Sammuel Oppenheime
6. Electronic Components and Materials by S M DHIR

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Semester-2 (With effect from June 2011)  
PAPER II: Digital Electronics Circuits  
**[3 credit course- 3 hours per week]**

**Unit I:** Number systems and codes [10 hrs]

Introduction to number systems, Decimal, Binary, Octal and Hexadecimal number systems, inter conversion and arithmetic in various number systems, Binary codes, 8421, 2421, BCD, Excess 3, Gray code, ASCII, error detecting code, parity and check sum methods, error correcting code, hamming code.

**Unit II:** Logic Gates and Boolean algebra [12 hrs]

Binary operations like AND, OR, NOT, truth table, NAND & NOR gates, De-Morgans Theorem, NAND & NOR as universal logic gates, Laws of Boolean algebra, simplification of Boolean expression using Boolean algebra, special logic gates XOR and XNOR truth table and its applications, logic and truth table, logic diagram/ circuit from expression and vice versa using basic and universal logic gates.

**Unit III:** K Maps and Combinational circuits design [15 hrs]

Mean term and max term in Boolean expression, introduction of K map, drawing k map for 3 variable and 4 variable expressions, pairs, quads, octate in k map, reduction of Boolean expression using k map, Don't care problems and redundant groups, various examples, Half adder, full adder, half subtractor, full subtractor, various code converter, parity detection and generation, multiplexer and demultiplexer, decoder, encoder

Reference Books:

1. Fundamentals of Digital Circuits by A Anand Kumar, PHI
2. Principles of Digital Electronics by K Meena, PHI
3. Digital Systems: Principles and Application, by Tocci and Widmer, PHI
4. Digital Computer Electronics by Malvino and Brown
5. Digital Electronics by Malvino and Leach

## **List of Experiments / Laboratory work for Semester-2 (Paper –I & II)**

1. Study of characteristics curve of diode
2. Wave shaping circuits using diode
3. Study of characteristics curve of Zener diode
4. Study of characteristics curve of BJT.
5. Study of characteristics curve of FET.
6. Study of characteristics curve of UJT.
7. Study of characteristics curve of photo diode, photo transistor and opto coupler.
8. Study of basic logic gates.
9. Study of universal logic gates
10. Design, build and test Half adder and Full adder
11. Design, build and test Half subtractor and Full subtractor circuits.
12. Study of multiplexer
13. Design, build and test code converter