

**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
DEPARTMENT OF PHYSICS  
SURAT- 395 007 (GUJARAT)  
Revised Syllabus (Effective from June-2010)**

**M.Sc. (ELECTRONICS)  
Structure for Semester I**

**FIRST SEMESTER:**

Course No.	Title	Theory / Lab. Hours per week			External Exam. Marks	Internal Marks	Total Marks
		Theory	Tutorial	Total Hours			
EL-411	Mathematical Methods	04	01	05	70	30	100
EL-412	Solid State Devices	04	01	05	70	30	100
EL-413	Measurement	04	01	05	70	30	100
EL-414	Communication	04	01	05	70	30	100
EL-415	Practicals	09	01	10	140	60	200

**Practicals** : 14 to 16 practicals in each semester will be given in the Laboratory Work.

**DISTRIBUTION OF INTERNAL MARKS :**

For each Theory Papers :	Waitage of Marks
1. One Unit Test per Semester	15
2. One Tutorial Test per Paper Per Semester	10
3. One Assignment per Paper Per Semester	05
Total	30

For each Practical Course :	Waitage of Marks
1. One Practical Test per Semester	30
2. Assessment of Journal Per Semester	10
3. Viva Voce Examination	20
Total	60

## M.Sc. (Electronics) : Semester - I

### EL-411: Mathematical Methods

#### Unit - 1 :

##### Ordinary Differential Equations:

Solution in closed form, power series solution, miscellaneous approximate methods, the W K B method.

#### Unit - 2 :

##### Integral Transforms:

Fourier transforms, Laplace transforms, other transform pairs, applications of integral transforms.

#### Unit - 3 :

##### Special Functions:

Legendre functions, Bessel functions, hypergeometric functions, confluent hypergeometric functions. Hermite functions, spherical harmonics, Laguerre's functions.

#### Unit - 4 :

##### Partial Differential Equations:

Examples, general discussion, separation of variables, integral transform method.

##### Evaluation of Integrals:

Review of residue theorem, contour integration and evaluation of definite integrals, conformal mapping.

#### Unit - 5 :

##### Numerical Methods:

Finite differences, difference tables, interpolation, roots of equations.

##### Probability Distributions:

Binomial, poisson and Gaussian distribution, properties of distributions, fitting of experimental data.

## **Unit - 6 :**

### **Group Theory:**

Introduction to groups and group representations, definitions, sub-group and classes, group representation, characters, physical applications, infinite groups, SU(2), SU(3).

### **Recommended Books**

1. J. Mathew & R.L. Walker, Mathematical Methods of Physics Benjamin (IBH) 1979.
2. H. Margenau and G.M. Murphy, Mathematics of Physics and Chemistry, East-West Press, 1975.
3. P.M. Morse and H. Feshbach, Methods of Theoretical Physics, Vols.1-2, McGraw Hill-Kogekusha, 1953.
4. V.M. Trivedi, Ganitiya, Bhautikshashtra, Vol.3, Univ. Book Production Board, Ahmedabad, 1974.
5. D.D. Desai, Ganitiya Bhautikshashtra, Vol.2, Univ. Book Production Board, Ahmedabad, 1978.
6. R.V. Churchill, Complex Variables and Applications, McGraw Hill, 1960.
7. Mathematical Physics, B.S. Rajput Pragati Prakashan, 1997.

### **Theory Tutorials (EL-411)**

(These are problem solving and discussion sessions. Concepts in theory and related aspects can be discussed).

1. Applications of series solution method
2. Application of W.K.B. method
3. Problems of method of separation of variables for PDE.
4. Problems of hypergeometric and confluent hypergeometric functions.
5. Addition theorem of spherical harmonics
6. Residue theorem applications
7. Contour integration
8. Evaluation of definite integrals using contour integration.
9. Problems on numerical methods
10. Problems on distributions
11. Constructing character tables
12. Representation theory of groups
13. S U (2), S U (3) – applications.

## **M.Sc. (Electronics) : Semester - I**

### **EL-412:Solid State Devices**

#### **Unit-1 (Introduction)**

Carrier transport phenomena, Phonon spectra, optical thermal and high field properties of semiconductor, basic equation for semiconductor device operation.

#### **Unit-2 (p-n Junction Diode)**

Depletion region and depletion capacitance, current-voltage characteristics, junction breakdown.

#### **Unit-3 (Bipolar transistor)**

Junction transistors, microwave transistors, power transistors, switching transistor.

#### **Unit-4 (Thyristor)**

Basic characteristic, Shockley diode and three terminal Thyristor, uni-junction transistor and trigger Thyristor.

#### **Unit-5 (Optical Devices)**

Optical absorption, solar cell, photo-detectors, photoluminescence and electroluminescence, light emitting diode, laser diode.

#### **Unit-6 (Semiconductor Power Devices)**

Power bipolar transistor, power MOSFETs, heat sinks and junction temperature, power thyristor, diac and triac, IGBT, SIT, HEMT.

#### **Recommended Books:**

1. D.A. Neamen, Semiconductor Physics and devices, Tata McGraw-Hill Publishing Company Limited. 2002.
2. S.M. Sze, Physics, of semiconductor devices, Wiley-Interscience, 1981.
3. B.G. Streetman, Solid State Electronic Devices, Prentice-Hall of India Private Limited 3<sup>rd</sup> Ed.1994.
4. R.M. Warner and B.Z. Grang, Transistors, John Wiley, 1983.

### **Theory Tutorials (EL-412)**

- 1 Importance and Effects of carrier transportation in semiconductors.
- 2 Study of the decay of photo-excited carriers in semiconductors using Maxwell Equations.
- 3 Applications of diode.
- 4 Transient behavior of the Diode.
- 5 Applications of switching transistor.
- 6 Comparison between microwave transistor and switching transistors.
- 7 Applications of Shockley diode.
- 8 Applications of thyristor for low and medium power control.
- 9 Circuit design for photo detection techniques.
- 10 Applications of solar cell and its limitations.
- 11 Applications of laser diode.
- 12 Circuit design for power control using power devices.

## **M.Sc.- (Electronics) : Semester - I**

### **EL-413: Measurement**

#### **Unit-I :**

##### **Measurement :**

Aims of measurement, experimental planning, Types of experiment Design Factors, Experiment Design Protocol and examples. Report writing some General comments, Types of Reports, Contents of a Report.

#### **Unit-2 :**

##### **Signal Conditioning and Conversion :**

Introduction, Transducer Bridges, Instrumentation Amplifiers, A.C. Amplifiers, D.C. Amplifier, Change Amplifiers, Analog to Digital Conversion, Digital to Analog Conversion, Voltage to frequency and frequency to voltage converters, Interference, Grounding, Screens and Shielding.

#### **Unit-3 :**

##### **Pressure measurement :**

Pressure measurement - Introduction, Mechanical Pressure-measurement Devices, Bourdon Tube, Diaphragm and Bellows Gages, Low pressure measurement, The McLeod Gage, Pirani Thermal conductivity Gage, Knudsen Gage, Ionization Gage, Alphatron.

#### **Unit-4 :**

##### **Temperature measurement & other Physical Quantity :**

Temperature measurement -Introduction, Temperature Scales, Temperature measurement by Mechanical Effect, Temperature measurement by Electrical Effect, Temperature measurement by Radiation. Thermocouple compensation, Thermal conductivity measurement, Measurement of Viscosity, Humidity measurement, pH measurement.

#### **Unit-5 :**

##### **Strain Measurement :**

Stress and strain - Strain Measurement, Electrical Resistance Strain Gages, Measurement of Resistance Strain-Gage outputs, Temperature compensation, strain gage Rosettes. The unbounded Resistance strain Gage.

## **Unit-6 :**

### **Solar Radiation Measurement Counter :**

Data transmission and Telemetry- Introduction Modulation and Encoding method overview, Transmission media, Bandwidth and Noise Restrictions.

### **Reference Books**

1. J.P. Holman, Experimental Methods for Engineers, Tata-McGraw Hill  
(seventh Edition 2004)
2. E.O. Deoblien, Measurement - An Introduction, Tata McGraw Hill ( )
3. Instrumentation, Measurement and Feedback, Barry G. Johnes, TMH edition ( )

### **Theory Tutorials (EL-413)**

1. Concepts of Measurement
2. Errors
3. Uncertainty Analysis
4. Chi-square test
5. Graphical Analysis
6. Proof Reader's Marks.

## M.Sc.- (Electronics) : Semester - I

### EL-414: Communication

#### Unit-1 :

##### Review of General communication system:

Transmitter, channel & noise, source, Receiver, need for modulation, Bandwidth requirement, spectral analysis, sampling function, Response of a linear system, Normalized power in a Fourier expansion, power spectral density, effect of transfer function on power spectral density, convolution, power & energy transfer through a network, correlation between waveforms, power & cross correlation, Autocorrelation, Autocorrelation of a periodic waveform, autocorrelation of non periodic waveform of finite energy.

#### Unit- 2 :

##### Frequency Translation :

A method of frequency translation, Recovery of the base-band signal, Amplitude modulation Double sideband suppressed carrier AM, Generation of DSB-SC signals, Demodulation of DSB-SC Signals. Complementary amplitude modulation, sideband & carrier power, generation & demodulation of AM signals single sideband AM, Generation & demodulation of SSB Signals, vestigial side band modulation, comparison of various amplitude modulation systems, frequency division multiplexing.

#### Unit-3 :

##### Frequency modulation :

Mathematical representation of an FM signal, spectrum of an FM signal, phase modulation, stereophonic FM broadcasting, intersystem comparisons Frequency & phase modulation, frequency & amplitude modulation, generation of FM waves Indirect method of Armstrong & direct generation, Demodulation of FM signals, phase locked loop analysis of phase locked loop, second order phase locked loop.

#### Unit-4 :

##### Noise :

External & internal noise, noise calculations, noise figure, noise temperature, noise in Amplitude modulation system, Advantage of super-heterodyne principle : Single channel DSB-SC, square law & envelope demodulator.

## **Unit-5 :**

### **Noise in FM systems :**

calculation of output signal & noise powers, Pre-emphasis & de-emphasis : Single Channel, Pre-emphasis & de-emphasis in commercial FM broadcasting.

Sampling theorem : low pass signals, pulse amplitude modulation, other forms of pulse modulation, time division multiplexing, Bandwidth required for transmission of PAM signals, comparison of FDM & TDM systems.

## **Unit-6 :**

### **Quantization of signals :**

Quantization error pulse code modulation, PCM system, companding DPC (Differential PCM) Delta modulation & adaptive delta modulation.

digital carrier schemes : FSK, PSK & DPSK, Compatible color Television (CCTV)

multiplexing & de-multiplexing of luminance & Chrominance signals.

### **Reference Books**

- 1 Principles of communication systems : H.Taub & D.L.Schilling, Second Edition, McGraw-Hill.
- 2 Radio Engineering : (Applied Electronics Vol.II) : G.K.Mithal
- 3 Modern Digital & Analog communication systems : B.P.Lathi
- 4 Electronic communication systems : G. Kennedy
- 5 Fundamentals of communication systems: J.G.Proakis & M. Salehi, Pearson Education.
- 6 Electronic communications : D. Roddy & J. Coolem, PHI.
- 7 Digital & Analog communication systems : K. Samshanmugum.

### **Theory Tutorial (EL-414)**

- 1 Fourier Transform:
  - (a) From Fourier series to Fourier transforms
  - (b) Basic properties of Fourier transform.
  - (c) Fourier transform for periodic signals
- 2 Parseval's theorem
- 3 Introduction to modulation & demodulation
- 4 Normalized power
- 5 Comparison of FDM & TDM
- 6 Phase locked loop application
- 7 Natural & Flat-top sampling
- 8 Elements of a digital communication system source encoder / decoder, channel, modulator - demodulator & other functional blocks
- 9 Comparison of Analog & digital communication systems.

## **M.Sc.- (Electronics) : Semester - I**

### **EL-415 : Practicals**

- (1) To design, build & test voltage regulator using IC -741.
- (2) To design, build & test Schmitt Trigger Circuit.
- (3) To design, build & test Half Adder & Subtractor using basic gates.
- (4) To design, build & test Binary to Gray Code Converter.
- (5) To design the basic RAM memory cell & its Conversion to 2x1 RAM.
- (6) (i) Study of Characteristics of UJT,  
(ii) To design, build & test UJT as a relaxation Oscillator.
- (7) Study of LVDT & Strain Gauge.
- (8) To design, build & test Phase Shift Oscillator.
- (9) To design, build & test Astable Multi-vibrator.
- (10) To design, build & test Bistable Multi vibrator.
- (11) Study of Characteristics of FET.
- (12) To design, build & test 4-bit serial Input Parallel Output Left Shift Register using J K Flip-flops & its modification using D- Flip-flop.
- (13) To design, build & test Digital to Analog Converter.
- (14) (i) To design, build & test 4-bit Binary up counter.  
(ii) A module N-counter using J K flip-flops & other Gates.

#### **Reference Books**

1. OP-AMPS & Linear Integrated Circuits : Ramakant A. Gayakwad, PHI, 1988.
2. Solid State Pulse Circuit : David A. Bell, Reston Publishing Comp., Inc. Reston, Virginia, 1976.
3. Digital Principles & Application : Albert P. Malvino & Donald P. Leach, McGraw-Hill, International Editions, 1987.

#### **Laboratory Tutorial**

1. Study of FM & PM Modulation
2. Study of Double Sideband (DSB) & Single Sideband (SSB) amplitude Modulation
3. Study of Water Level Measurement System
4. Study of Pressure Measurement
5. Study of Analog Signal Sampling & Reconstruction.