

**SAURASHTRA UNIVERSITY , RAJKOT**  
**TEACHING AND EXAMINATION SCHEME FOR**  
**B.E. SEM IV<sup>th</sup> ( Electronics & Communication Engg.)**

Code No.	Subject	Teaching		Examination Scheme				
		Lect.	Prac.	Theory	Paper Hrs.	Prac./Oral	Term Work	Total
401	Communication Engineering-I	4	2	100	3	25	25	150
402	Transmission Lines and Networks	4	2	100	3	25	25	150
403	Electronics Measurement and Instruments	4	2	100	3	25	25	150
404	Electrical Technology	4	2	100	3	25	25	150
405	Linear Integrated Circuits	4	2	100	3	25	25	150
	<b>Total</b>	<b>20</b>	<b>10</b>	<b>500</b>	<b>-</b>	<b>125</b>	<b>125</b>	<b>750</b>

# 401 : Communication Engineering-I

THEORY SCHEME		EXAMINATION SCHEME				
THEORY	PRACTICAL	THEORY	PAPER	PRACTICAL/ORAL	TERMWORK	TOTAL
Hours	Hours	Marks	Hours	Marks	Marks	Marks
4	2	100	3	25	25	150

1. **Introduction to Communication engineering** : Various technological developments to date, various applications of Communications, Telephone, Video and computers. Introduction to INTERNET and ISDN. Various types of Communication systems, Simplex, half-duplex and full duplex systems. Brief introduction to various Communication channels. Important terminologies used in Electronic Communications. Optimum utilization of resources in Communication systems.
2. **Introduction to Noise** : Internal noise and external noise. Various types of internal noise. Definition of noise figure and noise temperature and their relationship. Noise figure of cascaded networks.
3. **Introduction to Modulation** : Necessity and advantages of modulation. Amplitude Modulation. Various types of AM. DSBSC, SSBSC, their relative advantages and disadvantages. Modulation index and its measurement, Envelope method and trapezoidal method. Amplitude Modulation circuits. Amplitude demodulator circuits, AM transmitter, AM receivers.
4. **Angle Modulation** : Frequency modulation and phase modulation, Frequency spectrum for sinusoidal FM, Equivalence between PM and FM. Digital phase modulation, Angle modulation circuits, Demodulators for angle modulation, FM transmitters, Pre emphasis and de-emphasize circuits, FM broadcast receivers.
5. **Receivers** :- Super heterodyne receivers, Integrated circuit receivers.
6. **Radio wave propagation** : propagation in free space, propagation through troposphere and ionosphere, Surface waves, Low frequency, Very low frequency and extremely low frequency propagation.
7. **Basic principles of digital communication** : Advantages of digital Communication, Introduction to pulse code modulation. Introduction to digital modulation techniques - ASK, FSK, and PSK.
8. **Antennas for Communication** : Basic antenna concepts, Polarization concepts – horizontal and vertical polarizations. Antennas used in broadcast transmitters .

**Reference Books :-**

- 1) Electronic Communications – Dennis Roddy and John Coolen.
- 2) Principles of Communication Systems – Herbert Taub and Donald S. Schilling.
- 3) Electronic Communication Systems – Kennedy and Davis.

## 402: Transmission lines and Networks

THEORY SCHEME		EXAMINATION SCHEME				
THEORY	PRACTICAL	THEORY	PAPER	PRACTICAL/ORAL	TERMWORK	TOTAL
Hours	Hours	Marks	Hours	Marks	Marks	Marks
4	2	100	3	25	25	150

1. **Network theorems:** Review of basic theorems , Mesh and Node analysis, superposition theorem, Thevenin's theorem, Norton's theorem, Millman's theorem, Maximum power transfer theorem, Star –Delta transformation, Numerical problems on dc and ac circuits based on above.
  
2. **Resonance :** Series resonance: impedance, and phase angle of series resonance circuits. Voltage and currents in series resonant circuit, effect of resistance on frequency response curve. Bandwidth. selectivity and quality factor.  
 Parallel resonance: resonant frequency for tank circuit. Variation of impedance with frequency, Q factor of parallel resonance circuit, reactance curve , numerical problems based on above.  
 Magnetic coupled circuits: Mutual Inductance, coefficient of coupling. Ideal transformer , Single tuned and double tuned circuits.
  
3. **Two port networks:** Relationship between two port variables, short circuit admittance parameters, open circuit impedance parameters. Transmission parameters, Hybrid parameters, two generator equivalent circuits for above parameters, Relationship between parameter sets. Parallel, series connections and cascading of two port networks.
  
4. **Filter and attenuators:** Characteristics of High pass, Low pass, Band pass, Band Stop filter , constant K type filter, M derived filter , section M derived: PF, HPF, BPF, and BSF.  
 Attenuators: L type, T type , TT type , Lattice attenuators.
  
5. **Network Functions.:** Concept of complex frequency Network, Functions for one part and two part network, poles and zeros of network function. Restrictions on poles and zeros location for driving point function in transfer function, Time domain behaviour from poles and zero plot. Stability of active network.
  
6. **Transient Response:** Review of Laplace transform. RL circuit step voltage response, RL circuit step current response, RC circuit step voltage response, RC circuit step current response, RLC step voltage response, RLC step current response, RL and RLC circuit. sinusoidal response, General solution in term of  $r$ ,  $\omega_n$  &  $Q$ .

**7. Transmission lines:- Introduction, Propagation through lines, Determination of secondary line constant, Underground cables, Wave velocity, Distortion in low frequency lines, General line equations, High frequency lines, Reflection, Line impedance, Impedance matching in high frequency, Smith charts.**

**Reference book:**

- 1. A course in Electrical Circuit Analysis-Soni-Gupta (Dhanpat. Rai Publication.)**
- 2. Circuit and Networks Analysis & Synthesis – Sudhakar and Shyam mohan**
- 3. Theory & Problems of Electrical Circuits -- Josheph. A. Administer.**
- 4. Network Filters & Transmission Lines – P.K. Jain  
Gurbir Kaur ( Technical Education Series)**
- 5. Circuit Theory – Chakrubarti.**

## 403: Electronic Measurement and Instruments

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	25	25	150

1. **Introduction:** Measuring systems, its requirements. Classifications with block diagram, Methods of measurement. Instrumentation fundamentals & terminology: error, accuracy, precision, sensitivity, linearity, reliability, calibration and & their definition and explanation, Standards of measurement.
2. **Concepts of Measuring Instrument :** PMMC instruments, Moving iron instruments, Dynamo-meter type instruments, Calibration of type of instruments, AC & DC Current measurement, Ammeters, Galvanometer, extension of current ranges, calibration, Voltage measurement, voltmeter. Extension of voltmeter. calibration, electronic voltmeter, Digital Voltmeter, Integrating & non integrating types, Power measurement: Principle, wattmeter. Extension of wattmeter, effect of power factor. Multimeter: Principle types, working calibration, digital multimeter. Resistance measurement: Ohmmeter: Principle types, working and calibration Frequency: time & Measurements, Principle types & working, calibration. (l) Noise measurement of different types.
3. **Comparison type Measuring Instruments:** (a) Principle. (b) Potentiometer type instruments. (c) Bridges (AC&DC): Working principle mathematical expression, applications. comparison among them.
4. **Oscilloscope:** (a) Basic Oscilloscope: Block diagram, CRT. Horizontal & vertical deflection system. trigger circuit, delay line, sweep generator. (b) Types of oscilloscope: Dual trace CRO, dual beam CRO, storage CRO, sampling digital storage CRO. (c) CRO accessories. (d) CRO applications.
5. **Instruments:** (a) Signal generators: sine wave, pulse, sweep generator, function generator VCO. (b) LCR meter, measurement of L.C.R.Q. & tan- (c) RF power meter. (d) Signal analysis wave, thermionic analyzer, distortion analyzer, spectrum analyser introduction to Logic Analyzer. (e) Pattern generator. (f) Transistor Tester & IC tester. (g) Curve tracer.

6. **Transducers:** (a) Definition Principle classification & selection of transducer. (b) Principle types, construction, material, range & application of following transducers. 1. Temperature transducers. 2. Displacement transducers. 3. Pressure transducer. 4. Light Intensity measurement transducer. 5. Flow measurement transducer. 6. Level measurement transducer. 7. Speed measurement transducer. 8. PH measurement transducer.

**Reference Book:-**

1. Electrical and electronic instruments and measurements -- Sawhany
2. instrumentation devices and systems – Rangan Sharma
3. Electronic instrumentation and measurements – David Bell
4. Electronic measurements and instrumentation -- Oliver Cage
5. Electronic Instruments – Nakva & Chaudhary

## 404: Electrical Technology

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	25	25	150

1. **D.C. Generator**:- Introduction, Constructional details & types, Working principle, Losses, Armature reaction, E.M.F. equation, Open circuit characteristics. Internal & External characteristics. Conditions for building up of voltage.
2. **D.C. Motor**:- Working principle, Construction details & types, Concept of back of e.m.f, Characteristics of dc motors, Types of Starters, Various speed control methods including electronics control, Concept of electric braking of DC motor, Applications.
3. **Single Phase Transformer**:- Introduction, construction details & types principles of operation, e.m.f equation, working on no-load & on-load, Equivalent circuit, Regulation, Losses & efficiency, Testing of transformer, parallel operation of transformer, auto-transformer.
4. **Poly-phase Transformer**:- Working principle of three phase transformer, Construction details, Connection diagrams of star-star, delta-delta, delta-star, v-v, T-T connections.
5. **Three-phase induction motor**:- Working principle, construction details & types, Torque-slip characteristics, equivalent circuit, testing of three-phase induction motor, speed control methods, reversing direction of rotation.
6. **Single Phase Induction Motor**:- Introduction, working principle, starting, split phase motors, capacitor start motor, capacitor start- capacitor run motor, Equivalent circuit, Testing of single phase induction motor, shaded pole motor, repulsion motor, series motor, Reluctance motor, Hysteresis motor.
7. **Servo Motor**:- Working principle, Construction details, types of motor, torque calculations, application of AC & DC servo motors. Stepper Motor: Working principles, construction, application.
8. **Electric Devices**:- Working principles of relays & contactors, Normally open (NO) and Normally closed (NC) contacts, Internal circuit diagram of A.C motor starter ( D.O.L., Automatic star-delta starter, Auto-transformer starter), Techo-generator.
9. **Fractional Horse Power (F.H.P.) Motor**: Working principles, Construction and applications of F.H.P. motors. Universal motors, selsyns, synchros, reluctance motors. Single-phase synchronous motors, Hysteresis motors.

**Reference Books: -**

1. **Textbook of Electrical Tech. – B. L. Theraja Vol & II.**
2. **Alternating Current (A C) machines – M.G. SAY.**
3. **Electrical Technology – H.Cotton.**
4. **Fractional Horse Power Electrical Machines – Armenaky & Filk, MIR Publication.**
5. **Control System Engg – J. J. Nagraj & M.Gopal.**
6. **Introduction to Electrical Engineering- M. S. Naidu, S.Kamakshaiah. (TMH)**
7. **Basic Electrical Engineering- D.P.Kthari, I.J.Nagrath. (TMH)**

## 405 : Linear Integrated Circuits

THEORY SCHEME		EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	25	25	150

### 1. Introduction to Operations Amplifier :

- Definition, Symbol & Detail study of Block diagram of operational Amplifier, Ideal characteristics of Op-Amp.
- Study of differential amplifier: AC & DC analysis of dual input balanced output type differential Amplifier, Comparative study of other configurations of differential Amplifier (detail analysis of other configuration is not expected), CMRR.
- Analysis of typical Op-Amp equivalent circuit.
- Op-Amp parameter & parameter measurements, variation in offset voltage & current with respect to power supply, Study of time & thermal drifts, Universal offset balancing techniques.
- Study of IC 741, OP07, LM 308, FET Op-Amp CA 3140.

### 2. General applications of OPAMP :

- Open loop & close loop configurations of Op-Amp, Virtual ground concept.
- Summing scaling & overaging amplifiers using Op-Amp (INV & NIV).
- Differential Amplifier using Op-Amp. Subtractor circuit instrumentation amplifier study of IC 725.
- V to I, I to V convertors, Precision rectifiers, log & antilog amplifiers.

### 3. Frequency Response of Op-Amp:

- Frequency response characteristics, Small signal closed loop frequency response, Closed loop stability consideration.
- High frequency Op-Amp equivalent circuit.
- Frequency compensation & slew rate consideration.
- Transient response characteristics.
- Study of Integrator & differentiator (including frequency response of circuit).

### 4. Comparators :

- Basic comparators, Comparator characteristics, Limitations of Op-Amps as comparator, High speed precision type comparator.
- Schmitt trigger, window detector.
- Clippers, Clampers
- Peak detector
- Sample & Hold circuit.

## **5. Active filters :**

- (a) Basic filter definitions – Advantages of active filters
- (b) First & second order low pass & high pass Butterworth filters
- (c) Band pass & Band reject filters.
- (d) Determination of transfer function by Nodal analysis.

## **6. Waveform Generators :**

- (a) Square waves, Triangular wave, Sawtooth wave, Waveform generators using Op-Amp
- (b) Study of IC 555 timer, Block diagram & Multivibrator configurations
- (c) Oscillator : RC oscillators (phase shift & Wien bridge) using Op-Amp
- (d) Study of IC 8038.

## **7. PLL :**

- (a) Voltage to Frequency & Frequency to Voltage convertors operating principle, Study of LM 311.
- (b) Study of VCO ( voltage controlled oscillator )
- (c) Study of block diagram of PLL.
- (d) Transfer curve and applications
- (e) Study of IC 565, IC 4046.

## **8. Voltage Regulators :**

- (a) Basic operating principle of linear voltage regulators (Series & Shunt types) & switching type regulators
- (b) Factors affecting stability of output voltage
- (c) Design of series regulator
- (d) Concept of pre regulating
- (e) Study of short circuit protection circuits
- (f) Fold back protection
- (g) Study of IC 78XX & 79XX series
- (h) Study of IC 723.

## **Reference Books :**

1. An introduction to operational amplifiers with linear IC application – John wiley & son publications Fulk Emberrg.
2. Operational amplifiers – G.B. Clayton, ELBS publication.
3. Op-Amps & linear integrated circuits – Ramakant A. Gyakwad,(PHI)
4. Operational amplifiers – Tobeys & Gramme
5. Integrated circuits - Botkar.
6. Linear data Handbook of National Semiconductors corporation.