$19 \times 6 = 114$

EXTC Engg

III & IV

Old. Course.

UNIVERSITY OF MUMBAI

Old Course

Scheme of Instructions & Examination

at

B.E.

(Electronics & Telecommunication Engineering)

(R-2001)

UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTIONS & EXAMINATION
at
B.E.(Electronics & Telecommunication Engineering)
(R-2001)
(Revised Scheme Considering 60 Minutes' Period Instead of 45 Minutes' Period as per AICTE Guide-lines)

SEMESTER-III

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	* Applied Mathematics -III	4	-	-	3	100	-	-	-	100
2.	Electronics –I	4	3	-	3	100	25	-	-	125
3.	# Electrical Networks	3	2	-	3	100	25	-	-	125
4.	Logic Design.	3	3	-	3	100	25	-	-	125
5.	* * Numerical Techniques	3	2	-	3	100	25	-	-	125
6.	Principles of Control Systems	3	2	-	3	100	25	-	-	125
Total		20	12	-	-	600	125	-	-	725

* Subject common with Electrical, Electronics, Instrumentation and Biomedical Engineering branches.
** Subject common with Electronics, Biomedical and Electrical Engineering branches.
# Subject common with Instrumentation Engineering branch.

SEMESTER-IV

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	*Applied Mathematics -IV	4	-	-	3	100	-	-	-	100
2.	Electronics-II	3	3	-	3	100	25	25	25	175
3.	Signals and Systems	4	-	1	3	100	25	-	-	125
4.	Wave Shaping Techniques	3	3	-	3	100	25	25	25	175
5.	Principles of Communication Engineering	3	3	-	3	100	25	-	25	150
6.	Electromagnetic Wave Theory	4	-	1	3	100	25	-	--	125
Total		21	9	2	-	600	125	50	75	850

* Subject common with Electrical, Electronics, Instrumentation and Biomedical Engineering branches.

SEMESTER-V

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	* Applied Maths –V	4	-	-	3	100	-	-	-	100
2.	* Presentation and Communication Techniques	2	2	-	-	-	25	--	25	50
3.	Computer Architecture and organization	3	-	1	3	100	25	-	-	125
4.	Communication circuits	3	3	-	3	100	25	-	-	125
5.	Filter Theory	3	2	-	3	100	25	-	-	125
6.	** Elements of Microprocessors	3	3	-	3	100	25	-		125
7.	Elements of Microelectronics	3	-	-	3	100	25	-	-	125
Total		21	10	1	-	600	150	—	25	775

* Subject common with Electrical, Electronics, Instrumentation and Biomedical Engineering branches.
** Subject common with Instrumentation Engineering branch.

SEMESTER-VI

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	# Indudtrial Economics and Management	3	-	-	3	100	-	-	--	100
2.	Electronic Instrumentation	3	2	-	3	100	25	-	25	150
3.	Probability and Random processes	3	-	2	3	100	25	-	--	125
4.	Antenna and wave propagation	4	2	-	3	100	25	-	25	150
5.	Microcontrollers & Embedded programming	4	3	-	3	100	25	25	25	175
6.	TV and Video Engg.	3	3	-	3	100	25	-	25	150
Total		20	10	2	-	600	125	25	100	850

Subject common with Electrical, Electronics and Instrumentation Engineering branches.

SEMESTER-VII

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	* Digital Communication	3	2	-	3	100	25	-	25	150
2.	Mobile Communication System	4	-	1	3	100	25	-	-	125
3.	Microwave Devices and Circuits	4	2	-	3	100	25	-	25	150
4.	Discrete Time Signal Processing	4	2	-	3	100	25	-	25	150
5.	Elective I	4	2	-	3	100	25	-	25	150
6.	Project – A	-	-	4	-	-	25	-	-	25
Total		19	8	5	-	500	150	-	100	750

* Subject common with Electronics Engineering branch.

Elective -I (Any one)
1) Wireless Network
2) Data Compression and Encryption
3) Radar Engineering
4) SpeechPprocessing
5) Microwave Integrated Circuits
6) Simulation of Communication Systems

SEMESTER-VIII

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper (Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Satellite Communication	4	-	2	3	100	25	-	25	150
2.	Optical Fiber Communication	4	2	-	3	100	25	-	25	150
3.	Computer Communication Networks	4	2	-	3	100	25	-	25	150
4.	Elective II	4	2	-	3	100	25	-	25	150
5.	Project – B	-	8	-	-	-	50	-	50	100
Total		16	14	2	-	400	150	-	150	700

Elective II
Wireless Networks
Digital Voice Communication
Telecommunication Network Management
Microwave Amplifier and Oscillator Design
Optical Network
Internet Communication Engineering

S.E. (Electronics & TelecommunicationEngg.)

Subject: - Applied Mathematics –III

Lectures: 4 Hours / week **Paper:** 100 Marks **Duration:** 3 Hours

1. **Laplace Transform**:
   - 1.1. Functions of bounded variation
     Laplace transforms of 1, t^n, e^{at}, sinat ,cosat, sinhat and coshat, erf(t) Linear Property of L.T. First shifting theorem, Second shifting theorem
     $L\{t^n f(t)\}$, $L\{f(t)/t\}$, $L\{\int f(u)du\}$, $L\{d^n/dt^n f(t)\}$. Change of scale property of L.T. Unit step functions, Heaviside, Dirac delta functions, Periodic functions and their Laplace transforms.
   - 1.2 Inverse Laplace Transforms
     Evaluation of Inverse L.T, Partial fractions method ,Convolution theorem
   - 1.3 Applications to solve initial and boundary value problems involving ordinary diff. Equations with one dependent variable

2. **Matrices(I)**
   - 2.1 Types of matrices ,Adjoint of a matrix, Inverse of a matrix , Rank of Matrix, Linear dependence and independence of rows and columns of a matrix over a real field , Reduction to normal form and partitioning of a matrix.
   - 2.2 Systems of Homogeneous and non-homogeneous equations, their consistency and solutions.

3. **Complex Variables**.
   - 3.1 Functions of complex variables, Continuity and derivability of a function , Analytic functions, Necessary condition for f(z) to be analytic, sufficient condition (without proof),Cauchy-Riemann conditions in polar forms. Analytical and Milne-Thomson method to find analytic functions f(z)= u+ iv where (i) u is given (ii) v is given (iii) u+v (iv)u-v is given.,Harmonic functions and orthogonal trajectories
   - 3.2 Mapping
     Conformal mapping ,Bilinear mapping, Fixed points and standard transformation ,inversion,reflection ,rotation and magnification.

4. **Fourier Series:**
   - 4.1 Orthogonality and orthonormal functions, Expression for a function in a series of orthogonal functions, Dirichlet's conditions,Fourier series of peroidic functions with period 2π and $2l$ (Derivations of fourier coefficients a_o, a_n, b_n is not expected) Dirichlets Theorem Even and Odd functions. Half range sine and cosine expansions Parseval's Identities (without proof)
   - 4.2 Complex form of Fourier Series
     Fourier integral and fourier transform with properties in detail.

References:

1. P.N.Wartikar/J.N.Wartikar, Text book Applied Mathematics, Pune Vidyarthi Griha Prakashan, 1981.
2. Matrices Shantinarayan
3. Vector Analysis Murray R. Stiegel , Schaum Series.

S.E. (Electronics & TelecommunicationEngg.)
Sem-III
Subject: Electronics – I

Lectures: 4p/week
Practical: 3p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Diode applications:**

   Limiters, clampers, voltage multipliers.

2. **Special purpose diodes:**

   Zener diode, schottky barrier, varactor, optical diodes, PIN diodes, Laser diodes.

3. **Biasing of BJT:**

   DC operating point, BJT characteristics & parameters, fixed bias, emitter bias with and without emitter resistor, analysis of above circuits and their design, variation of operating point and its stability.

4. **Biasing of FET:**

   Types of FET, characteristics and parameters of JFET, MOSFET, enhancement MOSFET, different biasing circuits, their analysis and design, location of operating point and its stability. CMOS devices.

5. **Small Signal BJT amplifiers:**

   AC equivalent circuit, hybrid, re model and their use in amplifier design. BJT as switch, BJT as a diode, emitter coupled pair, design considerations.

6. **Small signal FET amplifiers:**

   AC operating point, common source, common drain, common gate amplifiers.

7. **Power Circuits:**

   Filters (L, LC, C, Multiple LC, pi) regulators using zener , BJT in series, BJT in shunt.

8. **Power switching and control devices:**

   Characteristics, ratings and applications of silicon controlled switch (SCS), Shockley diode, DIAC, TRIAC, UJT, PUT, Photo transistor, light activated SCR, optical couplers, IGBT, Power MOSFET.

List of Experiments:

1. Applications of diodes as a Clipper (positive / negative and both), a clamper (positive / negative) and voltage multiplier.
2. Transistorized series regulator and shunt regulator using zener diode. Find its parameters.
3. Design and analysis of BJT amplifier with fixed bias, collector bias, potential divider bias. Determination of its DC operating point.
4. Design and analysis of biasing circuits of JEFT. Determination of its DC operating point.
5. Input and output characteristics of BJT in CB, CC, CE configuration and its parameters.
6. Output characteristics and transfer characteristics of JFET. Finding its parameters, mutual conductance and amplification factor.
7. BJT as a voltage amplifier. Determination of its performance parameters (Av, Ai, Ri, Ro)
8. FET as a voltage amplifier and determination of its performance parameters.
9. UJT relaxation oscillator with different peaking voltages and frequencies.
10. FWR with different types of filters and finding its ripple factor.

Term Work:

Each student has to appear for at least one written test during the term. Report on experiments (at least eight from the list of suggested experiments) along with a graded answer paper shall be submitted as termwork.
The distribution of term work will be as follows:

Report on experiments – 15 marks.
Written Test – 10 marks.

Text Books:

1. Electronic devices – Floyd
Pearson Education Asia publication
2. Microelectronic Circuits, analysis & design – Rashid
PWS Publishing Company

Reference Books:

1. Electronics devices and circuit theory –Robert L. Boylestad
2. Microelectronics – Jacob Millman & Arcin Grabel
Mc-Graw Hill publication.
3. Electronic Circuit Analysis and Design – Neamen
Mc-Graw Hill publication.

S.E. (Electronics & TelecommunicationEngg.)
Sem-III
Subject: ElectricalNetworks

Lectures: 3p/week
Practical: 2p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Network Analysis:**
   DC Network Analysis with independent and dependent sources, AC Network analysis

2. **Graph Theory:**
   Fundamental definitions, The Incidence matrix, The Loop matrix and cut-set matrix, Loop, Node and Node – pair equations.

3. **Time response of first and second order systems:**
   Initial conditions, Evaluation and Analysis of Transient and steady state responses using classical Technique and Laplace Transform.

4. **Network Functions:**
   Network functions for the one port and two port networks, Driving point and transfer functions, Poles and Zeros of Network functions and constraints on their locations, Time domain behavior as related to the Pole-Zero plot.

5. **Two – port parameters:**
   Open circuit, short circuit, transmission and hybrid parameters, relationship between parameter sets, reciprocity and symmetry conditions, interconnection of two-port networks, T and Pi representation, Terminated two-port networks.

6. **Elements of relisability theory:**
   Causality and Stability, Hurwitz Polynomials, Positive real functions

7. **Fundamentals of Network Synthesis (for driving point functions only):**
   Elementary Synthesis Procedures, Properties and synthesis of L-C, R-C and R-L impedance and admittance functions, synthesis of R-L-C functions

Term work

Each student has to appear for at least one written test during the term. At least eight assignments covering all the topics of syllabus with a graded answer paper shall be submitted as termwork.
The distribution of term work will be as follows:

Report on experiments – 15 marks.
Written Test – 10 marks.

Text Books:

1. Network Analysis – M. E. Van Valkenburg
   PHI publication
2. Network Analysis and Systems – Frenklin F. Kuo
   John Wiley & sons publication.
3. Electrical Network theory – Balabancan and Bickart
   Robert E. Kreiger publishing company.

S.E. (Electronics & TelecommunicationEngg.)
Sem-III
Subject: Logic Design

Lectures: 3p/week
Practical: 3p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Number Systems:**
   Decimal, binary, octal hexadecimal number system and conversion, binary weighted codes, signed numbers, 1s and 2 s complement codes, binary arithmetic
2. **Boolean Algebra:**
   Binary logic functions, Boolean laws, truth tables, associative and distributive properties, DeMorgans theorems, realization of switching functions using logic gates.
3. **Combinational logic:**
   Switching equations, canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, Quine-McCluskey Minimization technique, mixed logic combinational circuits, multiple cutput functions
4. **Analysis and Design of Combinational logic:**
   Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers as function generators, binary adder, subractor, BCD adder, binary comparator, arithmetic logic units.
5. **Sequential logic:**
   Sequential circuits, flip-flops, clocked and edge triggered flip-flops, timing specifications, asynchronous and synchronous counters, counter design with state equations, Registers, serial in serial out shift registers, tristate register, register transfer, timing considerations.
6. **Sequential circuits:**
   State diagrams and tables, transition table, excitation table and equations. Examples using flip-flops. Analysis of simple synchronous and asynchronous sequential circuits, construction of state diagram, counter design
7. **Programmable logic:**
   Programmable logic devices, programmable read only memory, programmable logic arrays and programmable array logic, Design using PAL, field programmable gate arrays.
8. **Digital integrated circuits:**
   Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin, logic families and their characteristic TTL, LSTTL CMOS, and ECL integrated circuits and their performance comparison, open collector and tristate gates and buffers.

References:

(1) R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 1984.
(2) M.Morris Mano, "Degital Design", Prentice Hall International-1984.
(3) Malvino & Leach, "Digital Principal and Applications", Tata McGraw Hill, 1991.
(4) Malvino, "Digital Electronics", Tata McGraw Hill, 1997.
(5) James Bignell & Robert Donovan, "Digital Electronics", Delmar, Thomas Learning, 2001.
(6) Jog N .K ,. "Logic Circuits", 2nd edition, Nandu Publishers & Printers Pvt. Ltd. 1998.
(7) Alan b. Marcovitz, "Introduction to Logic Design", McGraw Hill International,2002.

3 copy (9)

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(Electronics & TelecommunicationEngg.)
Sem-III
Subject: Numerical Techniques

Lectures: 3p/week
Practical: 2p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Errors in numerical computation:**
   Their types, analysis and estimation. Error propagation.
2. **Roots of Equations (including relevant engineering applications):**
   Bracketing methods - the Bisection method, the false position method, Open methods - the Newton Raphson method, the secant method.
3. **Systems of Linear Algebraic equations (including relevant engineering applications):**
   Gauss Elimination method – technique, pitfalls, improvement, Gauss Jordan method, LU decomposition and matrix inversion, Gauss Seidel method.
4. **Curve fitting (including relevant engineering applications):**
   Interpolation – Newton's divided difference, language-interpolating polynomials, Approximation least square approximation technique, linear regression, and polynomial regression.
5. **Numerical differentiation (including relevant engineering applications):**
   Methods based on interpolation and finite differences.
6. **Numerical Integration (including relevant engineering applications):**
   The Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.
7. **Solution to Ordinary differential equations (including relevant engineering applications):**
   Taylor series method, Picard's method of successive approximation, Runge-Kutta methods, Euler's method, Euler's predicator corrector method, Runga-Kutta method of second and forth order, Boundry value and Eigan value problems.
8. **Optimization (including relevant engineering applications and transportation problems):**
   One dimensional unconstrained – Golden section search, quadratic interpolation, Newton's method, multidimensional unconstrained – Direct method, Gradient method, linear programming.

Term Work:

Each student has to appear for at least one written test during the term. The term work will comprise of developing and testing at least ten application programs using various techniques to solved related problems (Using C /C++ and/or any simulation software)
The distribution of term work will be as follows:

- Report on experiments – 15 marks.
- Written Test – 10 marks.

Text Books:

1. Numerical Methods for Engineers – Seven C. Chapra, Raymond P. Canale
   Tata Mc-Graw Hill Publication
2. Applied Numerical Methods for Engineers (Using MATLAB and C) –
   Robert J. Schilling, Sandra L. Harris
   Thomson Learning publication

(10)

S.E. (Electronics & TelecommunicationEngg.)
Sem-III
Subject: Principles of Control Systems

Lectures: 3p/week
Practical: 2p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Introduction:**
   Open loop and closed loop systems, servomechanisms, basic structure of a feedback control system.
2. **Dynamic Models and Responses:**
   Dynamic model of an RLC network, state variable model, impulse response model, transfer function model, standard test / disturbance signals and their models, transfer function model and dynamic response of a second order electrical system.
3. **Control System Components:**
   Basic units of a feedback control system, reduction of system block diagrams, signal flow graph, Mason's gain rule, block diagram reduction using Mason's gain rule, operational amplifier used as an error detector, servo potentiometer, DC and AC servomotors, tachogenerator, stepper motor, synchros, bloke diagram model of a typical control system using simplified sub-system, transfer function blocks.
4. **Feedback Control System Characteristics:**
   Stability, sensitivity, disturbance rejection, steady state accuracy, transient and steady state responses of a second order system, effect of additional zeros and poles, desired closed loop pole locations and dominant poles, steady state error constants, system type numbers and error compensation.
5. **System Stability Analysis and Compensator Design:**
   System stability bounds, routh stability criterion, relative stability and range of stability, root locus concept, system characteristic equation, plotting root loci, design of cascade lag – lead compensation, minor loop (rate) feedback compensation.
6. **Nyquist Criterion and Stability Margins:**
   Nyquist stability criterions, Nyquist plot, gain and phase margins, bode plot of magnitude and phase and determination of stability margins.
7. **Feedback System Performance:**
   Performance specifications in frequency domain, correlation between frequency domain and time domain specifications, constant -M circles, Nichols chart, stability margins from sensitivity function. Design of cascade lag lead compensation using Bode plot. Minor loop (rate) feedback compensation.

Term Work

Each student has to appear for at least one written test during the term. Report of at least eight experiments and two assignments, both together covering all the topics of the syllabus along with a graded answer paper shall be submitted as term work.
The distribution of term work will be as follows:

Report on experiments – 15 marks.
Written Test – 10 marks.

Text Book:

1. Control Systems – Principles and Design – M. Gopal
   Tata Mc-Graw Hill Publication

Reference Books:

1. Control Systems Engineering – I. J. Nagrath and M. Gopal
   New Age International Publishers
2. Modern Control Engineering – Katsuhiko Ogata
   Prentice Hall of India publication

S.E. (Electronics & TelecommunicationEngg.)

Subject: - APPLIED MATHEMATICS -IV

Lectures: 4 Hours / week

Paper: 100 Marks,
Duration: 3 Hours

1. **Vector calculus & Analysis**:
   - 1.1 Scalar and vector point functions , Directional derivative ,Curl and divergence , Conservative , Irrotational and solenoidal fields.
   - 1.2 Line integral ,Green's theorem for plane regions and properties of line integral , Stoke's theorem , Gauss's divergence theorem (with out proof) related identities and deductions.

2. **Matrices(II)**:

   2.1 Brief revision of vectors over real field , Inner product . Norm , Linear independence and orthogonality of vectors.
   - 2.2 Characteristic polynomial , characteristic equation , characteristic roots and characteristic vectors of a square matrix, Properties of characteristic roots & vectors of different Types of matrices such as Orthogonal matrix, Hermitian matrix ,Skew –Hermitian matrix, Diagonable matrix, Cayley Hamilton's theorem(without proof), Functions of a square matrix, Minimal polynomial and Derogatory matrix.
   - 2.3 Quadractic forms , congruent and orthogonal reduction of quadratic form, Rank, index ,signature and class value of quadratic form.

3. **Complex variables**:

   3.1 Line integral of a function of complex variable.,Cauchy's theorem for analytic function (with proof), Cauchy's Goursat theorem (without proof), properties of Line integral,Cauchy's integral formula and deductions.
   - 3.2 Singularities and poles:
     Taylor's and Laurent's development (without proof) , Residue at isolated singularity and its evaluation.
   - 3.3 Residue Theorem application to evaluate real integrals of type
     $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ and $\int_{-\infty}^{\infty} f(x)dx$.

References:

1. Complex Variable - Churchill, McGraw Hill, 2nd edition, 1960.
2. Theory of Function Complex Variable - Shantinarayanan, S. Chand & Co. , 1979.
3. Engineering Mathematics - S.S.Sastri, Prentice Hall of India, 2nd edition, 1989.
4. Element of Applied Mathematics - P.N.Wartikar/J.N.Wartikar, Pune Vidyarthi Griha Prakashan, 1981.

S.E. (Electronics & TelecommunicationEngg.)
Sem-IV
Subject: Electronics – II

Lectures: 3p/week
Practical: 3p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks
Practical: 25 marks
Oral: 25marks

1. **Frequency response:**

General concepts, decibels, low frequency response characteristic, Gain Bandwidth product, high frequency response, frequency response of cascade amplifiers, effect of low frequency and high frequency on coupling and bypass capacitors.

2. **Multistage amplifiers:**

RC coupled, transformer coupled, direct coupled, Low and high frequency considerations, cascade amplifier, darlington pair, their performance, Analysis and design considerations of multistage amplifiers, effect of source and load resistance.

3. **Feedback amplifiers:**

Feedback concept, ideal feedback amplifier, classification of feedbacks, Topology, analysis and design of different types of negative feedback, General analysis of multistage feedback and multiloop feedback amplifiers.

4. **Large signal amplifiers:**

Harmonic distortion and power efficiency of Class A, B, AB and C amplifiers, Thermal considerations and design selection of heat sinks.

5. **Oscillators:**

Principle of oscillation, RC oscillator, Wein bridge oscillator, twin T oscillator, oscillator with LC feedback, Colpitt oscillator, clapp oscillator, Armstrong oscillator, Crystal controlled oscillator.

6. **Operation Amplifiers:**

Differential amplifiers, their types, small signal analysis, differential stage, level shifter & other blocks integrated OP-Amp, Study of OP- Amp parameters like open loop / closed loop response, frequency Response, positive and negative feedback, stability, slew rate OP-Amp using MOS, BiCMOS, JFET.

7. **Applications of OP-Amp:**

Comparator, adder, subtractor, integrator, differentiator, instrumentation amplifier, log, antilog amplifier.

List of Experiments:

1. Frequency response and performance parameters of two stage BJT amplifier.
2. Frequency response and performance parameters of two stage FET amplifier.
3. Cascade amplifier and finding its parameters
4. Voltage series feedback using BJT/ FET. It's effect on frequency response.
5. Current series feedback using BJT / FET. It's effect on frequency response.
6. Op-Amp in inverting / non-inverting mode.
7. Op-Amp as an integrator and differentiator.
8. RC Phase shift oscillator for different amplitude and frequency.
9. Colpitt / Hartley oscillator.
10. Class C amplifier and its efficiency.

In addition

At least 2 experiments using simulation software.

Term Work:

Each student has to appear for at least one written test during the term. Report on experiments (at least six from the list of suggested experiments) along with a graded answer paper shall be submitted as termwork. Report on experiments will further include at least two using simulation software making a total of eight experiments.

The distribution of term work works will be as follows:

Report on experiments – 15 marks.

Written Test – 10 marks.

Text Books:

1. Electronic devices – Floyd
   Pearson Education Asia publication.
2. Microelectronic Circuits analysis & design – Rashid
   PWS Publishing Company

Reference Books:

1. Electronics devices and circuit theory – Robert L. Boylestad
2. Microelectronics – Jacob Millman & Arcin Grabel
   Mc-Graw Hill publication.
3. Electronic Circuit Analysis and Design – Neamen
   Mc-Graw Hill publication.

S.E. (Electronics & TelecommunicationEngg.)
Sem-IV
Subject: Signals And Systems

Lectures: 4p/week
Tutorial: 1p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Introduction:**

Signals, systems, classification of signals, elementary signals – analog and discrete signals, basic operation of signals classification of systems.

2. **Time domain representation for linear time invariant systems (analog & discrete):**

Convolution, series and parallel connection of systems, causal, non-causal, memory less, with memory, stable invertible systems, de-convolution, impulse, step and differential equation representation for LTI systems. (RC, RLC, Ckt) state variable description.

3. **Fourier representation for continuous time and discrete time signals:**

Representation of signals in terms of orthogonal functions, orthonormal signals, Fourier series, discrete time Fourier series, Fourier transform, discrete time Fourier transform, their properties Fourier transform representation of periodic signals.

4. **Laplace transforms:**

Introduction to Laplace transforms, its properties, LT of elementary signals unilateral Laplace transform, Inversion of Laplace transform, using L.T. with or without initial conditions, Transfer function of system, state variable description.

5. **Z – transform:**

Introduction, Z transform of elementary signals, ROC, Properties of Z transform, Inversion of Z transform, system function, solution of difference equation, unilateral Z transform.

6. **State space analysis:**

State variable model, transfer function from state variable model and vice versa, diagonalization, equivalent state equations, solution of LTI state equations, Laplace transform method, state equation discrete time systems, Discretisation of continuous time state equations.

Assignment / Tutorial

1. Elementary signals continuous time and discrete time and basic operations on them.
2. Classification of signals and systems – causal / non-causal, T.I. / L.T.I., stable / unstable.
3. Convolution of continuous time and discrete time sequences.
4. Laplace transform of sequences using properties.
5. Z transform and ROC.
6. Solution of difference and differential equations.
7. Fourier series of periodic signals.
8. Fourier transform of signum function, impulse and aperiodic signals.
9. State variable model of a system and its impulse response.
10. Unilateral Laplace transforms.

Term Work:

Each student has to appear for at least one written test during the term. At least eight assignments from the suggested list along with a graded answer paper shall be submitted as termwork.
The distribution of term work will be as follows:

Assignments – 15 marks.
Written Test – 10 marks.

Text Books:

1. Signals And Systems – Simon Haykin & Barry van veen
   John Wiley publication.
2. Signals And Systems – Oppenheim & Willsky
   Prentice Hall of India Publication

Reference Books:

1. Signals And Systems – I. J. Nagrath, S. N. Sharan
   Tata Mc-Graw Hill publication
2. Signal Processing and Linear Systems – B. P. Lathi
   Oxford publication.
3. Analog and digital signal processing – Ashok Ambardar
   Thomson Learning Publication

S.E. (Electronics & TelecommunicationEngg.)
Sem-IV
Subject: Wave Shaping Techniques

Lectures: 3p/week
Practical: 3p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks
Practical: 25 marks
Oral: 25marks

1. **Voltage time base generators:**
General features of a time base signal, exponential sweep circuit, sweep circuits using UJT, fixed amplitude sweep, transistor constant current sweep, miller and bootstrap time base generators (transistor based), compensating networks.

2. **Timer and Applications:**
IC 555 timer functional block diagram, 555 in Astable and monostable modes, Typical applications like ramp generator, missing pulse detector, PWM modulator, PPM modulator, Schmitt trigger.

3. **Waveform generators:**
Using OP-Amps – Schmitt trigger, square and triangular wave generators, VCO, pulse generators, staircase generator, function generator ICs – 566, 8038, XR 2206.

4. **Voltage regulators:**
IC 723 – Functional block diagram, design of low and high voltage regulators, current limiting. Three terminal regulator ICs like 78XX series and 2M 317. Switching mode regulators using IC PWM3524

5. **Signal conditioning and data conversion:**
S/H circuits, Analog MUX and DEMUX, D/A and A/D converters, Electronic Analog Computation, Analog multipliers, precision AC/DC Converters.

List of Experiments:

1. Sweep Circuit using UJT
2. Transistor bootstrap circuit
3. 555 as Astable and monostable multevibrator.
4. 566 applications
5. Schmitt trigger
6. Triangular waveform generator
7. PWM modulator
8. Low and High voltage regulators using 723.
9. A/D Converter.
10. D/A Converter.
11. Sample and hold circuit
12. Precision Rectifiers

Term Work:

Each student has to appear for at least one written test during the term. Report on experiments (at least eight from the list of suggested experiments) along with a graded answer paper shall be submitted as termwork.

The distribution of term work will be as follows:

Report on experiments – 15 marks.
Written Test – 10 marks.

Text Books:

1. Pulse, Digital and switching waveforms – Millman and Taub
Mc-Graw Hill publication
2. Microelectronics – Millman and Grabel
Mc-Graw Hill publication
3. Integrated Circuits – K. R. Botkar
Khanna Publication

Reference Books:

1. Linear Integrated Circuits – Dr. Roy Choudhury, Shail Jain
Wiley Eastern Limited publication
2. Designing with Op-Amps – Sergio Franco
Mc-Graw Hill Publication (International Edition)

S.E. (Electronics & Telecommunication Engg.) SEM IV

Subject: Principles of Communication Engineering

Lectures: 3 hours / week	Theory Paper: 3 hours and 100 marks
Practical: 3 hours / week	Term work: 25 marks ; Oral: 25 marks

Introduction:
Elements of a communication system, modulation and demodulation.
Noise in Communication systems, Signal-to-Noise ratio, Noise factor and Noise Figure, Equivalent Noise Temperature.

Amplitude Modulation:
DSB Full carrier AM – principles, modulator circuits, transmitters. Different types of AM, Suppressed – carrier AM, SSB, ISB – Principles, transmitters.

Angle Modulation:
Frequency modulation, Phase modulation, Effect of noise, FM modulators, Transmitters.

Radio receivers:
Receiver characteristics, TRF and Superheterodyne receivers, AM detectors, FM detectors, Receiver circuits.

Analog Pulse Modulation:
Sampling Theorem for Low – pass and Band – pass signals – proof with spectrum, Aliasing. Sampling Techniques – principle, generation, demodulation, spectrum. PAM, PWM, PPM – generation and detection.

Digital Transmission:
Quantization, Quantization error, Non-uniform quantizing, Encoding. PCM, DPCM, Delta modulation, Adaptive Delta modulation – transmission system, bandwidth.

Multiplexing:
Principle of TDM, FDM , Multiplexing hierarchies.

Line codes and their spectra

Text Books:

1. Wayne Tomasi, Electronic Communication Systems, Pearson Education, third edition, 2001.
2. Roy Blake, Electronic Communication Systems, Thomson Asia Pte. Ltd., Singapore, second edition, 2002.
3. Leon W Couch, Digital and Analog Communication Systems, Pearson Education, sixth edition.
4. Herbert Taub and Donald Schilling, Principles of Communication Systems, Tata McGraw-Hill, second edition.

(Text books 3 & 4 for Digital transmission and Multiplexing topics only)

Termwork:
The Termwork shall consist of at least eight experiments based on the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

S.E. (Electronics & TelecommunicationEngg.)
Sem-IV
Subject: Electromagnetic Wave Theory

Lectures: 4p/week
Tutorial: 1p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

1. **Coulomb's law and electric field intensity:**
   Coulomb's law, electric field intensity, calculation of electric field intensity for various charge distributions, streamlines and sketches of field.
2. **Electric flux density and Gauss's law:**
   Electric flux density, Gauss's law, applications of Gauss's law, vector operator and divergence theorem
3. **Energy and Potential:**
   Energy expended in moving a point charge in an electric field, line integral, potential and potential difference, calculations of electric field of both point charge and system of charges, potential gradient, dipole, energy density.
4. **Conductors, Dielectrics, Capacitance:**
   Current and current density continuity of current, conductor properties, Dielectric material and properties, capacitance, calculation of capacitance of various configurations method of images.
5. **Poisson and Laplace's equations:**
   Poisson and Laplace's equation and its applications, uniquness theorem, product solution of Laplace's equation.
6. **Stedy magnetic field:**
   Biot Savart law, Ampere's circuital law, curl of H, stoke's theorem, Megnetic flux and flux density, scalar and vector magnetic potentials of steady magnetic field lines.
7. **Time Verying Fields and Maxwell's equations:**
   Faraday's law concept of displacement currents, Maxwell's equations in point form, Maxwell's equations in Integral form, Boundary conditions and significance of Maxwell's equations
8. **Uniform Plane Waves:**
   Uniform plane waves in time domain in free space, sinusoidally time varying uniform plane waves in free space, wave equation and solution for material uniform plane. Waves in dielectries and conductors, reflection of uniform plane waves, significance of plane waves, polarization of waves.
9. **Poynting Vector and flow of power:**
   Poynting theorem, power flow for a plane wave, power flow in a concentric cable, Poynting vector about R-C lines, heterogeneous average and complex Poynting vector, Poynting loss in a Plane conductor.

Term work

Each student has to appear for at least one written test during the term. At least eight assignments covering all the topics of syllabus with a graded answer paper shall be submitted as the term work.
The distribution of term work will be as follows:

Report on experiments – 15 marks.
Written Test – 10 marks.

Text Books:

1. Engineering Electromagnetics – William H. Hayt
   Tata Mc-Graw Hill publication
2. Elements of Engineering Electromagnetics – Nannapaneni Narayana Rao
   Prentice Hall of India publication
3. Electromagnetic Waves and Radiating Systems – Edward C. Jordan, Keith G. Balmain

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Sem-IV
Subject: Electromagnetic Wave Theory

Lectures: 4p/week
Tutorial: 1p/week

Paper: 100 marks, 3Hrs.
Term Work: 25 marks

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