UNIVERSITY OF MUMBAI

Revised Syllabus

And Scheme of Examination

For

The Second Year

(Sem III & IV)

Of the

B.E. Degree Course

In Electronics & Telecommunication

(With effect from the academic year 2008-2009)

SCHEME OF INSTRUCTIONS AND EXAMINATION (R-2007)
UNIVERSITY OF MUMBAI

COURSE: ELECTRONICS AND TELECOMMUNICATION ENGG.

Second Year Engineering (Semester III & IV) (Revised-2007) Courses for Academic Year 2008-09, Electronics and Telecommunication Engineering **Scheme for**

Semester III

Sr. No.	Subjects	No. of Periods per week			Duration of Theory Paper(Hrs)	Marks				
		Lectures	Practical	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1	Applied Mathematics-III	4	-	-	3	100	-	-	-	100
2	Digital Logic Design	4	2	-	3	100	25	50	25	200
3	Electronic Devices & Circuits I	4	2	-	3	100	25	-	25	150
4	Electrical Networks	4	2	-	3	100	25	50	25	200
5	Electronic Instrumentation	4	2	-	3	100	25	-	25	150
6	Presentation and Communication Technique	2	2	-	-	-	50	-	-	50
Total		**22**	**10**	**-**	**-**	**500**	**150**	**100**	**100**	**850**

Semester IV

Sr. No.	Subjects	No. of Periods per week			Duration of Theory Paper(Hrs)	Marks				
		Lectures	Practical	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1	Applied Mathematics-IV	4	-	-	3	100	-	-	-	100
2	Analog & Digital IC-Design & Applications	4	2	-	3	100	25	-	25	150
3	Principle of Communication Engineering	4	2	-	3	100	25	50	25	200
4	Electronic Devices & Circuits II	4	2	-	3	100	25	50	25	200
5	Electromagnetic Wave Theory	4	2	-	3	100	25	-	25	150
6	Simulation Software workshop	-	2	-	-	-	25	-	25	50
Total		**20**	**10**	**-**	**-**	**500**	**125**	**100**	**125**	**850**

UNIVERSITY OF MUMBAI (Revised 2007)

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-III**

Subject: -Applied Mathematics-III

Periods per week	**Lecture**	**4**		
	Practical	**-**		
01 Period of 60 min	**Tutorial**	**-**		
			Hours	**Marks**
Evaluation System	**Theory Examination**	**3**		**100**
	Practical		**-**	**-**
	Oral Examination	**-**		**-**
	Term Work	**-**		**-**
	Total	**-**		**100**

Detailed Syllabus: **Lectures/Week**

3.1 Laplace Transforms: **10 Hours**

1. Definition, linearity property, Laplace transporm of standard functions- 1, Sinat, Cosat, Sinhat, Coshat..
2. First Shifting theorem, Second Shifting theorem, L {f(t)}, L{}, Change of scale property, L {}, L {} (All theorems with proof).

Convolution theorem (without proof)

3. Laplace transform of Periodic functions, Error Function, Heaviside Unit Step function and Dirac-delta function.

3.2 Laplace Transforms and Matrices **12 Hours**

3.2.1 Inverse Laplace transforms, Solution of Ordinary differential equations using the Laplace Transform method

3.2.2 Types of Matrices- Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Orthogonal and Unitary Matrices.

3.2.3 Inverse of a Matrix using Adjoint of a Matrix

3.3 Matrices **10 Hours**

1. Echelon form, Rank of a Matrix, Normal Form, PAQ in the Normal Form
2. System of Homogeneous and Non-homogeneous equations, their consistency and solution using rank of a Matrix.
3. Linear Dependence and independence of vectors.
4. Solution of a system of simultaneous linear equations using Gauss elimination method, Gauss-Jordan reduction method, Gauss-Seidel iterative method.

3.4 Fourier Series **12 Hours**

1. Definition, Dirichelt's conditions (statement only) Fourier Series of function with period 2. Euler's formulae (with Proof)

3.4.2. Fourier series of functions having Arbitrary period 2L.

Fourier series of odd and even functions.

2. Half range Fourier series, Parseval's identity (without proof), Complex form of Fourier Series, Orthogonal & Orthonormal functions.

3.5 Fourier Transforms **08 Hours**

1. Idea of Fourier Integral representation, Fourier Sine and Cosine Integral representation.
Fourier Sine and Cosine Transforms. Linearity property, Change of Scale property, Shifting property.
2. Convolution theorem (statement only) and related problems

3.Z **08 Hours**

6. Transforms

1. Sequence, Representation of a sequence. Basic operations on sequence. Basic operations on sequences, Definition of Z transforms, Linearity property (without proof). Z transforms of standard sequences- Sink, Cosk, Coshk, Sink, Cosk
2. Change of scale property, Shifting property. Inverse Z transforms, Convolution theorem (statement only).
3. Inverse transform by Direct Division, Binomial expansion and Partial fraction method.

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. One question will be compulsory and based on entire syllabus.
4. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3)
5 In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Recommended Books:

1) A Text Book of Applied Mathematics Vol. I & II by P.N.Wartilar & J.N.Wartikar, Pune Vidyarthi Griha Prakashan.
2) Higher Engg. Mathematics by Dr. B.S. Grewal, Khanna Publication
3) Higher Engg. Mathematics by B V Ramana, Tata McGraw-Hill Publication.
4) Advanced Engg. Mathematics by Wylie & Barret, 6th Edition
5) Advanced Engg,. Mathematics by Erwin Kreysizg, John Wiley & Sons, Inc
6) Linear Algebra and Applications by Gilbert Strang, 4th Edition, Thompson Books / Cole.
7) Matrices By Shantinarayan, S. Chand Publications.

UNIVERSITY OF MUMBAI (Revised 2007)

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-III**

Subject: -Digital Logic Design

Periods per week	**Lecture**	**4**		
	Practical	**2**		
01 Period of 60 min	**Tutorial**	**-**		
		Hours		**Marks**
Evaluation System	**Theory Examination**	**3**		**100**
	Practical	**3**	**50**	
	Oral Examination	**-**		**25**
	Term Work	**-**		**25**
	Total	**-**		**200**

Module	**Contents**	**Hours**
Objective	**Objectives of this course is to introduce to the students the basics of digital systems and its applications which are extensively used in computations which are extensively used in computation and data processing, control systems, communication and measurements.**	
Pre-requisite	**Concept of Diode, BJT and FET switching**	
1	Introduction to digital systems, comparison of digital and analog systems, number systems and conversion, binary arithmetic, codes, basic operations, Boolean laws, Universal gates, derived gates.	8
2	System definition, input – output relation, truth table formation, system equation in terms of minterms maxterms, SOP and POS forms. System equation reduction techniques- Boolean algebra, k-maps, quine-mcCluskey method. Implementation using basic and universal gates.	12
3	Combinational circuits – code conversion, adders, subtractors, multiplexers, de- multiplexers, encoders, decoders, PLDs, CPLDs, FPGAs. Design of combinational circuit as a solution to given problem.	12
4	Sequential circuits- latches, flip- flops, registers, counters.	12
5	General models of sequential circuit, derivation of state tables, state graphs, reduction of state tables, state assignment.	8
6	Introduction to Logic families and analysis of TTL, ECL and CMOS	8

Theory Examination :

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. All questions must be analytical oriented.
3. Only 5 questions need to be solved.
4. Question number 1 will be compulsory and covering the entire 6 modules.
5. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
7. No question should be asked from pre-requisite module.

Practical Examination:

Practical Examination will be based on any one experiment performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.

Oral Examination: Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work: Term Work shall consist of minimum eight experiment performed from the list of experiment given in the syllabus.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Practical List:

1. Implementation of X-OR and X-NOR using NAND and NOR
2. Design of adder, subtractor, BCD adder using IC 7483
3. Implementation of logic equations using MUX, DEMUX
4. Design of encoders and decoders
5. Conversion of flip flops
6. Design of counters and registers
7. Application of logic design – parity checker
8. Application of logic design- sequence detector

Recommended Books:

1. Digital Logic Comer, Oxford
2. Digital Logic Design Principles, Balbanian, Wiley
3. Digital Design, Vahid, Wiley
4. Fundamentals of logic design, Charles Roth, Cengage (Thomason)
5. Digital Fundamentals, Floyd / Jain Pearson
6. Fundamental of Switching theory and logic desing, Astola, Springer

UNIVERSITY OF MUMBAI (Revised 2007)

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-III**

Subject: -Electronic Devices & Circuits-I

Periods per week	**Lecture**	**4**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**-**	**--**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total	**-**	**150**

Module	**Contents**	**Hours**
Objective	**To understand the analysis and synthesis / design of BJT and JFET and diode applications.**	
	To understand the concept of design.	
Pre-requisite	**DC/AC network theorems**	

1 Biasing of BJT: 10 Hours

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

2. **Small Signal BJT amplifiers: 12 Hours**

AC equivalent circuit, Rin, Av, Ai, Ro, hybrid, re model and their use in amplifier design.
BJT as switch, BJT as a diode, emitter coupled pair, design considerations.
Design of CE, BJT amplifier.

3. **Biasing of FET: 12 Hours**

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

4. **Small Signal FET amplifiers: 10 Hours**

AC operation point, common source, common drain, common gate characteristics.
Design of CS, JFET amplifier.

5. **Power Circuits: 10 Hours**

Design of rectifier circuit with Filters (L, LC, C, Multiple LC, L & pi section) and regulator using zener, BJT in series, BJT in shunt.

6. Power switching and control devices: 6 Hours

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

Theory Examination :

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. All questions must be analytical oriented.
3. Only 5 questions need to be solved.
4. Two Questions will be compulsory and based on design of CE-BJT/CS-JFET amplifier/ Power circuits given in syllabus.
5. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
7. No question should be asked from **pre-requisite module.**

Oral Examination: Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term Work shall consist of minimum eight experiments and a written test. The

distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of laboratory experiments:

1. Find out h-parameters of BJT,
2. Find out the Stability factor of BJT- Fixed biased circuit with Re and without Re.
3. Find out the Rin, Ro, Av, & Ai of CE BJT amplifier and verify with theoretical value.
4. Design and implement CE-BJT amplifier and verify various parameters.
5. Find out the parameters of JFET
6. Draw the output and transfer characteristics of D-MOSFET, E-MOSFET.
7. Find out the the Rin, Ro, Av, of CE JFET amplifier and verify with theoretical value.
8. Design and implement CS- JFET amplifier and verify various parameters.
9. Design and implement FWR with LC filter and verify various parameters.
10. Design and implement transistorized Regulator (Series type) and verify various parameters.
11. Design and implement transistorized Regulator (Shunt Type) and verify various parameters.
12. Draw the characteristics of TRAIC/UJT.

Recommended Books:

1. Foundations of Electronics: circuits & devices, Russell L Meade, Cengage (Thomson)
2. Microelectronic Circuits Analysis and Design, Rashid, PWS Publishing
3. Electronic Circuit Analysis and Design, Donald, A Neamen, TMH
4. Electronic Devices & Circuits Theory, Boylestad, Nashelesky, Pearson Education
5. Electronic Devices and Circuits by A. K. Maini, Wiley
6. Electronic devices – Floyd, Pearson Education Asia publication
7. Microelectronics – Jacob Millman & Arcin Grabel, Mc-Graw Hill Publication.

UNIVERSITY OF MUMBAI (Revised 2007)

Class: S.E. (Electronics & Telecommunication Engg.)

Semester-III Subject: -Electrical Networks

Periods per week	**Lecture**		**4**	
	Practical		**2**	
01 Period of 60 min	**Tutorial**		**-**	
		Hours	**Marks**	
Evaluation System	**Theory Examination**		**3**	**100**
	Practical Examination	**3**	**50**	
	Oral Examination		**-**	**25**
	Term Work		**-**	**25**
	Total		**-**	**200**

Module	**Contents**	**Hours**
Objective	**To understand basic principles and components of Electrical, Electronic circuit elements.**	

Pre-requisite **Fundamentals of DC and R-L-C AC networks**

1. Network Analysis: 8 **Hours**

DC Network analysis with independent and dependent sources, AC Network analysis. Coupled coils-mutual inductance.

2. Graph Theory: **5 Hours** Fundamental defi

3. Time response of first and second order systems: **15 Hours** Initial conditions,

4. Network Functions: 12Hours 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. Draw Bode plot for all types of networks functions.

5. Two-port parameters: **12 Hours**

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 reliability theory: **10 Hours**

Causality and Stability, Hurwitz Polynomials, Positive real functions

7. Fundamentals of Network Synthesis (for driving point functions only): 10 Hours

Elementary Synthesis Procedures, Properties and synthesis of L-C, R-C and R-L impedance and admittance functions, synthesis of R-L-C functions.

Theory Examination :

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. All questions must be analytical oriented.
3. Only 5 questions need to be solved.
4. One Question will be compulsory and based on entire syllabus.
5. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
7. No question should be asked from **pre-requisite module.**

Practical Examination:

Practical Examination will be based on any one experiment performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term Work shall consist of minimum eight experiments and a written test.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of laboratory experiments:

1. Make Current dependent Current source and verify.
2. Make Voltage dependent Current source and verify.
3. Verify Thevenin's and Norton's Thecrem using, at lease, one dependent source.
4. Find out time constant for series R-L circuit.
5. Find out time constant for series R-C circuit.
6. Make suitable two-port network and find its Z-parameters.
7. Make suitable two-port network and find its h-parameters.
8. Draw the Bode plot for given network and verify.
9. Synthesis the R-C network.
10. Synthesis the R-L network.

Recommended 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.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-III**

Subject: -Electronic Instrumentation

Periods per week	**Lecture**	**4**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**--**	**--**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Module Objective — **Contents** — **Hours**

To understand basic principles and components of Electronic Measurements.

To understand Principles of Advanced Electronic Instruments and its application.

Pre-requisite — **The course begins with linear DC and AC circuits and familiarizes the student with standard measurement tools. The relationship between time and frequency domain measurements of circuits is a fundamental component.**

1. Sensors for Transducers: **12 Hours**

Potentiometers, Differential Transformers, Resistance Strain Gauges, Capacitance Sensors, Eddy-Current Sensors, Pizoelectric, Photoelectric
RTD, Thermisters, Thermocouple Sensors.

2. **Oscilloscopes** **12 Hours**

Specifications of general purpose Oscilloscope, Controls, sweep modes, applications Digital storage oscilloscope and its feature like Roll, Refresh, and sampling rate, applications of DSO in Communication, recent trends in oscilloscope technology.

3. **Signal Analyzers** **8 Hours**

Introduction to total harmonic distortion, wave analyzer and its applications, FFT analyzer and Network analyzer and their applications.

4. Measuring Instruments and Test Equipments **8 Hours**

True RMS meter, Q meter, Standard AC and DC sources, Instruments for digital and analog circuit testing and automatic test equipment.

5. Converters and digital Instruments **8Hours**

A/D and D/A converters and their types. Specifications, data loggers, significance of 3 ½ and 4 ½ digit, Automation in digital instruments, DMM, Digital frequency meter, Universal counter and their applications like event, ratio, totalizing and timers etc.

6. Data Transmission Techniques **8Hours**

Introduction to data transmission techniques, Pulse modulation, digital modulation techniques like Amplitude shift Keying, Phase shift Keying, telemetry and its applications in Instrumentation.

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved including compulsory question no. 1 which must cover all the topics given in the syllabus of the said subject.
3. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
4. No question should be asked from **pre-requisite module.**

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term Work shall consist of minimum eight experiments and a written test. The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of laboratory experiments:

1 . Measurement of True RMS value using True RMS meter.

2. To measure various physical phenomenon's viz. Temp. Pressure, Displacement etc. using different Transducers.
3. Q- Value measurement using LCR meter.
4. To measure Bandwidth using universal counter.
5. To measure X-amplifier bandwidth of CRO.
6. To measure time constant of relay using DSO
7. To build a function generator using IC.
8. To generate arbitrary waveform using arbitrary waveform generator.
9. To measure harmonics in different waveforms using FFT analyzer.
10. To study any one modulation technique.

Books Recommended:

1. Electronic Measurement and Instrumentation – H. Oliver and J.M.Cage, McGraw Hill, 2nd edition. 2. Instrumentation for Engineering Measurements, James Dally, William F. Riley and Kenneth G. McConnell, John Wiley and Sons. Inc., 2nd Edition 1993.
3. Digital Instrumentation, A.J. Bowens, McGraw-Hill, 1986.
4. Instrumentation Devices and Systems- C.S.Rangan, G.R. Sarma, V.S.V. Mani Tata McGraw Hill, 9th edition.
5.Elements of Electronic Instrumentation and Control , J.J.Carr, Prentice Hall, 3 rd ed.rd
6. Electronic Instrumentation and Measurement Techniques, W. Cooper, A. Helfric, PHI, 3nd edition.
7. Electronic Instrumentation, J.A. Alloca Prentics Hall, 2nd edition.
8. Handbook of Electronic Instrumentation, Coombs.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-III**

Subject: -Presentation and Communication Techniques

Periods per week	**Lecture**	**2**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**--**	**--**
	Practical Examination	**--**	**--**
	Oral Examination	**-**	**--**
	Term Work	**-**	**--**
	Total		**50**

1. Communication in a Business Organization: **06**

Internal & External Communication, Types of meetings, strategies for conducting successful business meetings, documentation (notice, agenda minutes, resolution) of meetings. Introduction to modern communication techniques (for e.g. e-mail, internet, video conferencing etc), Legal & ethical issues in communication (intellectual property rights, patents TRIPS, Geographical indications)

2. Advanced Technical Writing: **08**

a. Report – Writing : Definition and importance of reports. Qualities of Reports, language and style in reports, type of reports, formats (letter, memo, project-reports), methods of compiling data for preparing report.

b. Technical Paper Writing, Writing business Proposals.

3. Interpersonal Skills: **04**

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution, Assertiveness, Team-building, Decision-making, Time-management, persuasion.

4. Presentation Skills: **04**

Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis, Language Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation.

5. Career Skills: **04**

Preparing resumes and cover letters. Types of Resumes, Interview techniques: Preparing for job interviews, facing an interview verbal and non-verbal communication during interviews, observation sessions and role-play techniques to be used to demonstrate interview strategies (mock interviews)

6. Group discussion:

Group discussions as part of selection process, Structure of a group discussion, Dynamics of Group Behavior, Techniques for effective participation, Team work
and use of body language.

Term Work: Part-I (25 Marks): Assignments:
2 assignments on Communication topics
3 assignments on Report writing
3 assignments on Interpersonal Skills
2 assignments on career skills
At least one class test (written)

Distribution of term work marks will be as follows:
Assignment: 10 marks

Written Test: 10 marks

Attendance (Theory and Practical): 05 marks
Term Work: Part-II (25 Marks): Presentation;

Distribution of term work marks will be as follows:
Project report presentation: 15 marks
Group discussion: 10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Books recommended:
1. Fred Luthans: Organizational behavior, McGraw Hill
2. Lesikar and Petit, Report writing for business, Tata McGraw Hill
3. Huckin & Olsen, Technical writing and professional communication, McGraw Hill
4. Wallace & Masters, Personal development for Life & work, Thomson Lerning.
5. Heta Murphy, Effective Business Communication, McGraw Hill
6. Raman and Sharma, Report Writing.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-IV**

Subject: -Applied Mathematics-IV

Periods per week	**Lecture**	**4**	
	Practical	**--**	
01 Period of 60 min	**Tutorial**	**--**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**--**	**--**
	Oral Examination	**-**	**--**
	Term Work	**-**	**--**
	Total		**100**

Detailed Syllabus: **Hours**

4.1 Bessel Function **12 Hours**

1. Relation between Laplace and Bessel's differential equation, its solution by series method, Bessel function of first and second kind, Recurrence relations for,

2. Generating function of, Orthogonality of, Bessel-Fourier series of a function**.**

4.2 Matrices **10 Hours**

1. Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof), Similar Matrices, Orthogonally Similar Matrices

2. Functions of square Matrix, Dcrogatory and Nonderogatory Matrices.

4.3 Matrices and Complex Variables **12 Hours**

1. Quadratic forms over real field, Reduction of Quadratic form to a diagonal canonical form Rank, Index and Signature quadratic form, Sylvester's law of inertia

2. Value- class of a quadratic form-Definite, Semidefinite and Indifinite.

3. Functions of a Complex variable, Analytic Functions, Cauchy- Riemann equations in Cartesian and Polar-co-ordinates.

Harmonic functions, Analytical method and Milne Thomson method to find f(z)

4.4. Complex Variables **10 Hours**

1. Conformal Mappings and Bilinear transformations, Cross-Ratios, Fixed points of Bilinear Transformations.

2. Complex Integration

Complex line intergral, Cauchy's Integral theorem for simply. Connected regions (with proof) and Cauchy's Integral formula. (with proof);

4.5 Complex Variables **6 Hours**

1. Taylor's and Laurent's development (without proof) Zeros, Singularities and poles of function, Residue theorem (with proof)

2. Real definite Integrates of the form

4.6 Vector Integration 10 Hours 1. Line Integral, Properties of Line Integrals, Conservative fields, Scalar potentials. 2. Green's Theorem in a plane (Statement only), Surface Integrals, Divergence Theorem (statement only) Stoke's Theorem (statement only)

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. One question will be compulsory and based on entire syllabus.
4. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3)
5 In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Recommended Books:

1. Vector Analysis by Murray R. Spiegel, Schaum's Outline Series – McGraw Hill Publication.
2. Complex Variables by Murrey R. Spiegel, Schaum's Outline Series–McGraw Hill Pub.
3. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publications
4. Mathematical Methods by J N Sharma and R. K. Gupta, Krishna Prakashan Mandir (P) Ltd.
5. Calculas by Thomas, Finney, 9th Edition, Person Education
6, Linear Algebra and Application by Gilbert STrang, 4th Edition, Thompson Books/Cole.
7. Matrices by Shantinarayan, S. Chand Publications
8. A Text Book of Applied Mathematics Vol.I & II by P.N. Wartikatr & J.N. Wartikar, Pune Vidyarthi Griha Prakashan.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-IV**

Subject: - Analog and Digital IC-Design and Application

Periods per week	**Lecture**	**4**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**--**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**--**	**--**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**100**

Module	**Contents**	**Hours**
Objective	**This subject is a study of analog and digital integrated circuits and their applications. Many applications are best addressed by mixed-mode integrated circuits and systems, which relay on analog circuitry to interface with physical world, and digital circuitry for processing and control.**	
Pre- requisite	**Introductory course in electronics (EDC) to be conversant.**	
1.	**Circuits with Resistive Feedback:** Basic Op-Amp Configurations, Ideal Op-Amp Circuits analysis, Negative Feedback, Current –to-Currents Converters, Current Amplifier, Difference Amplifier, Instrumentation Amplifier, Instrumentation Applications.	**8 Hours**
2.	**Active Filters:** The Transfer function, First-Order Active Filters, Standard Second-Order Responses, KRC Filters, Multiple-Feedback Filters, State-Variable and Biquad Filters, Filter approximations, cascade design, generalized impedance converters, direct design, Switched capacitor filters.	**8 Hours**
3.	**Analog IC's** All Types of A/D Converter. Comparator Circuits and their applications, Sample and Hold Circuits, IC Power Amplifier. Analog Multipliers(Logarithmic multipliers, Log and Antilog Amplifiers. 555 Timer. VCD ICs (566) PLL ICs(565, 4046B). Function Generator IC 8038, XR 2206.	**8 Hours**
4	**Sequential Logic Design:** Clocked synchrounous state machine analysis, Clocked synchronous state machine design, designing state machines using state diagrams, state machine synthesis using transition lists, decomposing state machines, feedback sequential circuits, VHDL sequential circuits, VHDL sequential circuit design features	**10 Hours**
5	**Synchronus logic Design Practices:** Sequential Circuits documentation standards, use of latches and flipflops like switch debouncing, counters-ripple, synchronus and MSI, decoding binary counter states, counter in VHDL. Shift Registers, ring counter, Johnson counter, linear feedback shift register counter, Shift register in VHDL.	**10 Hours**

6	**Memory, CPLDs and FPGAs**	**8 Hours**

Types of memory devices, Read Only Memory (ROM), Read / Write memory, Static RAM, Dynamic RAM, Introduction to Xillinx XC 9500 CPLD family and Xilinx XC 4000 FPGA family.

Theory Examination :

1. Question paper will be comprise of total 7 questions, each of 20 marks.
2. All questions must be analytical and design oriented.
3. Only 5 questions need to be solved including compulsory question no.1 which must cover all the topics given in the syllabus of the said subject.
4. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
5. No question should be asked from **pre-requisite module.**

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term Work shall consist of minimum eight experiments and a written test. The

distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of laboratory experiments:

1) V-I and I-V converter.
2) Designing an Instrumentation amplifier for desired gain and testing practically the same.
3) Design, build and practically testing of 2nd order Low-pass, High-pass and Band-pass KRC filters for given cut-off or pass-band frequencies and Q.
4) Design, build and practically testing of R-2R ladder type A/D converter.
5) To build and practically testing of R-2R ladder type A/D converter.
6) Synchronus and asynchronus counter.
7) SISO and universal shift register
8) Design of MELAY Machine.
9) Design of MOORE Machine.
10) VHDL programs for counter's shift register's Melay and Moore machine.

Recommended Books:

1. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, 3rd edition, McGraw Hill International edition, 2002.
2. Digital Logic Design Principles, Norman Balabnian and Bradley Garlson, John Wiely and Sons, 2004.
3. Fundamentals of Digital Logic with VHDL Design, Stephen Brown & Zvonko Vranesic, First Edition, McGraw Hill International edition, 2002.
4. Micro Electronic Circuits, S. Sedra and K.C. Smith, Saunders College Publishing, Third Edition, 1991.
5. Digital Integrated Electronics, H. Taub and D. Schilling, McGraw Hill Publications, 1997.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-IV**

Subject: Principles of Communication Engineering

Periods per week	**Lecture**	**4**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**--**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**3**	**50**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**200**

Module	**Contents**	**Hours**
Objective	**To understand the fundamentals of communication engineering. To understand the concept of Broadcasting.**	
Pre-requisite	**Working of semiconductor devices like diode, BJT and JFET. Working or R-L-C resonance.**	
1	**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.	**10 Hours**
2	**Amplitude Modulation:** DSB Full carrier AM principles, modulator circuits, transmitters. Different types of AM, Suppressed carrier AM, SSB, ISB- Principles, transmitters.	**10 Hours**
3	**Angle Modulation:** Frequency modulation, Phase modulation, Effect of noise, FM modulators, Transmitters.	**10 Hours**
4	**Radio receivers:** Receiver characteristics, TRF and Super heterodyne receivers, AM detectors, AM detectors, FM detectors, Receiver circuits.	**10 Hours**
5	**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.	**10 Hours**
6	**Digital Transmission:** Quantization, Quantization error, Non-uniform quantizing, Encoding PCM, DPCM, Delta modulation, Adaptive Delta modulation- transmission, Adaptive Delta modulation – transmission system, and width**.**	**10 Hours**

Theory Examination:

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. One question will be compulsory and based on entire syllabus.
4. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from **pre-requisite module.**

Practical Examination:

Practical Examination will be based on any one experiment performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term Work shall consist of minimum eight experiments and a written test. The

distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of laboratory experiments:

1. Generation (DSB-FC) and detection of AM signal.
2. Generation (DSB-SC) and detection of AM signal
3. Generation (SSB-SC) and detection of AM signal
4. Generation and detection of FM signal.
5. Study of AM broadcast transmitter.
6. Study of AM broadcast receiver (superhet).
7. Study of AM broadcast receiver (superhet).
8. Measurement of sensitivity, selectivity and fidelity of broadcast receiver (superhet).
9. Generation of PAM signal and verify the sampling theorem.
10. Generation of PWM and PPM signal.
11. Generation of PCM.
12. Generation of DM.

Recommended 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.
5. Haykin Communication Systems, Wiley
6. William Stanley, Electronic Communication: Principles & Systems, Cengage(Thomson)
7. Alencar, Communication systems, Springer.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-IV**

Subject: - Electronic Devices & Circuits-II

Periods per week	**Lecture**	**4**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**--**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**3**	**50**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**200**

Module **Contents** **Hours**

Objective **To understand the analysis and synthesis/design of BJT and JFE applications. To understand the concept of design.**

Pre-requisite **DC/AC Analysis of BJT and JFET**

1. **Frequency response:** **5 Hours**

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

2. **Multistage amplifiers:** **15 Hours**

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. Differential amplifiers, their types, small signal analysis, differential stage, level shifter.

3. **Large signal amplifiers:** **13 Hours**

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

4. **Feedback amplifiers:** **12 Hours**

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

5. **Oscillators:** **10 Hours**

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

6. **Multivibrator Circuits:** **5 Hours**

Bistable Multivibrators, Schmitt Trigger**,**

Monostable Multivibrator, Retriggerable Monostable Multivibrator, Astable Multivibrator.

Theory Examination :

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. All questions must be analytical and design oriented.
3. Only 5 questions need to be solved.
4. Two questions will be compulsory and based on design of BJT / JFET circuits given in syllabus.
5. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3)

5 In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

6. No question should be asked from **pre-requisite module.**

Practical Examination:

Practical Examination will be based on any one experiment performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term Work shall consist of minimum eight experiments and a written test. The

distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 10 marks

Test (at least one) : 10 marks

Attendance (Practical and Theory): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of laboratory experiments:

1) Frequency response and performance parameters of two stage BJT amplifier.
2) Frequency response and performance parameter of two stage FET amplifier.
3) Design Multistage BJT amplifier and finding its parameters, Verify.
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) Design Multistage JFET amplifier and finding its parameters, verify.
7) Design and Verify the Darlington Amplifier.
8) RC Phase shift oscillator for different amplitude and frequency.
9) Colpitt / Hartley oscillator.
10) Class C amplifier and its efficiency.
11) Design Cascode BJT amplifier and finding its parameters, Verify.
12) Design Difference BJT amplifier and finding its parameters, Verify.
13) Design Astable Multivibrator, Verify.
14) Design Monostable Multivibrator, Verify.

Recommended Books:

1. Foundations of Electronics: circuits & devices, Russell L Meade, Cengage (Thomson)
2. Microelectronic Circuits Analysis and Design Rashid, PWS Publishing
3. Electronic Circuit Analysis and Design, Donald, A Neamen, TMH
4. Electronics devices and circuit theory – Boylestad Nashelsky, Pearson Education.
5. Electronic Devices and Circuits by A.K. Maini, Wiley
6. Electronic Devices – Floyd, Pearson Education Asia Publication.
7. Microelectronics – Jacob Millman & Arcin Grabel,Mc-Graw Hill publication.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-IV**

Subject: - Electromagnetic Wave Theory

Periods per week	**Lecture**	**4**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**--**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical Examination	**-**	**--**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Module	**Contents**	**Hours**
Objective	**To understand the fundamentals of Electromagnetic wave.**	
Pre-requisite	**Primary idea of electronic and magnetism.**	

1. Coulomb's law and electric field intensity: **16 Hours**

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: **08 Hours**

Electric flux density, Gauss's law, applications of Gauss's law, vector operator and divergence theorem.

3.Energy and Potential: **08 Hours**

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: **08 Hours**

Poisson and Laplace's equation and its applications, uniquness thorem, product solution of Laplace's equation.

6. Steady magnetic field:

Biot Savart law, Ampere's circuital law, curl of H, stoke's theorem, Magnetic flux and flux density, scalar and vector magnetic potentials of steady magnetic field lines.

7. Time Varying Fields and Maxwell's equations: **08 Hours**

Faraday's law concept of displacement currents, Maxwell's equations in point form, Maxewll's equations in Integral form, Boundary conditions and significance of Maxewll's equations.

8. Uniform Plane Waves: **16 Hours**

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 dielectrics 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 vector, Poynting loss in a Plane conductor.

Theory Examination :

1. Question paper will be comprising of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
4. Two questions will be compulsory and covering the entire syllabus.
5. Remaining questions will be mixed in nature. (e.g. suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3)

5 In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

6. No question should be asked from **pre-requisite module.**

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term work shall consist of minimum four experiments, & tutorials and a written test.

The distribution of marks for term work shall be as follows, Laboratory work

(Experiments, tutorials and Journal): 10 marks.

Test (at least one): 10 marks
Attendance (Practical): 05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

List of laboratory experiments:

1. Study of co-ordinate system.
2. Study of coulomb's law.
3. Study of Faraday's cage.
4. Study of static magnetic field.
5. Study of magnetic induction.

Recommended Books:

1. Engineering Electromagnetic- – William H. Hayt, Tata Mc-Graw Hill publication.
2. Elements of Electromagnetics, Sadiku, Oxford.
3. Engineering Electromagnetics, Ida, Nathan, 2nd edition, Springer.
4. Elements of Engineering Electromagnetics- Nannapnaeui Narayan Rao Prentice Hall of India publication
5. Electromagnetic Waves and Radiating Systems. Edward C. Jordan. Keith G Balmain, Pearson.

Class: S.E. (Electronics & Telecommunication Engg.) **Semester-IV**

Subject: - Simulation Software Workshop

Periods per week	**Lecture**	**-**	
	Practical	**2**	
01 Period of 60 min	**Tutorial**	**--**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**-**	**-**
	Practical Examination	**-**	**--**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**50**

Module	**Contents**
Objective	**Students should get extensive experience in using the most popular simulation tools used worldwide. This will give them confidence in coupling theory with practice and make them aware of trends in design and simulation of both research and industry.**
Pre-requisite	**Computer fundamentals**
1	Analog circuits (BJT/FET/MOSFET/IC)
2	Digital circuits (Combinational and Sequential circuits)
3	Communication fundamentals
4	Signal analysis and processing fundamentals
5	Electromagnetic Wave Theory
6	Computer programming skills

Our course prescribes that students should get extensive experience in using the most popular simulation tools used worldwide. This will give them confidence in coupling theory with practice and make them aware of trends in design and simulation of both research and industry. This should include learning design and simulation of analog circuits in PSPICE using both schematics and net listing. (either of them) will give students an introduction to digital VLSI. We recommend use of Xilinx 9.21 which is completely free and comes with its own simulation tool. SciLab/MATLAB is one tool which is used through the world for design and simulation of systems.
Student should be given in-depth knowledge about its use and should be excelled in using at least one of its tool-box thoroughly. Since many of the VLSI design tools used in industry (such as CADENCE) are LINUX operating system. This should include understanding the file system, use of command terminal, installation procedure of software packages, etc.

Apart from the prescribed course work, instructors are requested to use their own innovations and ideas to help students excel in use of these simulation Software Package can also be added to the course work.

Oral Examination:

Oral Examination will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:
Students are required to perform minimum six simulation experiments.

It could be required to perform minimum six simulation experiments.

It could be divided as (module 1, 2) two using PSIPCE, (module 3, 4) two using HDL and (module 5, 6) two using SciLab/MATLAB. Apart from this students should prepare list of the (7) most basic commands used in LINUX environment. Also one report of the (8) LINUX files system. All experiment reports should include details about the tools used, syntax, commands, etc. Students should be encouraged to use internet as a resource to learn and implement these experiments.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal): 20 marks Attendance (Practical): 05 marks
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended software:

- Design and simulation of analog circuits in PSPICE
- Design and simulation of basic digital circuits using HDLs like VHDL or/and Verilog
- Xilinx 9.2i with its own simulation tool
- SciLab/MATLAB, one tool for design and simulation of systems
- LINUX operating system