BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
III SEMESTER

Ref No.	Subject	SCHEDULE OF TEACHING				SCHEME OF EXAMINATION						
						THEORY				PRACTICAL		
		L	T	P	Total	Paper	Hrs.	Sess.	Total	Sess.	Viva-voce	Total
AS 301	Engineering Mathematics-III	3	1	-	4	100	3	50	150	-	-	-
EC311	Semiconductor Devices	3	1	-	4	100	3	50	150	-	-	-
EC361	Semiconductor Devices Lab	-	-	2	2	-	-	-	-	60	40	100
EE311	Linear Circuit Analysis	3	1	-	4	100	3	50	150	-	-	-
EE361	Linear Circuit Analysis Lab	-	-	2	2	-	-	-		60	40	100
CS311	Object Oriented Programming and Data Structures	3	1	-	4	100	3	50	150	-	-	-
CS361	Object Oriented Programming and Data Structures Lab	-	-	2	2	-	-	-	-	60	40	100
EE312	Electric Machinery-I	3	1	-	4	100	3	50	150	-	-	-
EE362	Electric Machinery –I Lab	-	-	3	3	-	-	-	-	60	40	100
AS306	Industrial Law and Entrepreneurship	3	-	-	3	30	3	20	50	-	-	-
WS-157	Vocational Training after Second Semester	-	-	-	-	-	-	-	-	50	-	50
Total		18	5	9	32	530	-	270	800	290	160	450

AS 301
Engineering Mathematics – III
Third Semester

L T P
3 1 0

External: 100
Sessional: 50

Course Duration: 45 lectures of one hour each.

Note for the paper setter: Total of 8 questions may be set covering the whole syllabus. Candidate will be required to attempt any 5 questions.

PART-A

Sequences and Series: Sequences, Limits of sequences, Infinite series, series of positive terms, Integral test, Comparison test, Ratio test, Root test. Alternating series, Absolute and Conditional Convergence, Leibnitz test. Power series: radius of convergence of power series, Taylor's and Maclaurin's Series, Formulae for remainder term in Taylor and Maclaurin series, Error estimates. (Scope as in Chapter 8, Sections 8.1 – 8.10 of Reference 2).

(8 Lectures)

Linear Algebra: Concept of linear independence and dependence, Rank of a matrix: Row – Echelon form, System of linear equations: Condition for consistency of system of linear equations, Solution by Gauss elimination method. Inverse of a matrix: Gauss – Jordan elimination method (Scope as in Chapter 6, Sections 6.3 – 6.5, 6.7 of Reference 1).

(7 Lectures)

Eigen values, eigen vectors, Cayley – Hamilton theorem (statement only). Similarity of matrices, Basis of eigenvectors, diagonalization

(Scope as in Chapter 7, Sections 7.1, 7.5 of Reference 1). **(7 Lectures)**

PART-B

Complex Functions: Definition of a Complex Function, Concept of continuity and differentiability of a complex function, Cauchy – Riemann equations, necessary and sufficient conditions for differentiability (Statement only). Study of complex functions: Exponential function, Trigonometric functions, Hyperbolic functions, real and imaginary part of trigonometric and hyperbolic functions, Logarithmic functions of a complex variable, complex exponents (Scope as in Chapter 12, Sections 12.3 – 12.4, 12.6 – 12.8 of Reference 1). **(8 lectures)**

Laurent Series of function of complex variable, Singularities and Zeros, Residues at simple poles and Residue at a pole of any order, Residue Theorem (Statement only) and its simple applications (Scope as in Chapter 15, Sections 15.1 – 15.3 of Reference 1).

(7 Lectures)

Conformal Mappings, Linear Fractional Transformations (Scope as in Chapter 12, Sections 12.5, 12.9 of Reference 1).

(8 Lectures)

References:

1. E. Kreyszig. Advanced Engineering Mathematics, Eighth Edition, John Wiley.
2. G. B. Thomas, R. L. Finney: Calculus, Ninth Edition, Pearson Education.
3. Michael D. Greenberg. Advanced Engineering Mathematics, Second Edition, Pearson Education.
4. R. V. Churchill, J. W. Brown. Complex Variables and Applications, Sixth Edition, McGraw-Hill, Singapore, 1996.
5. Vivek Sahai, Vikas Bist. Linear Algebra, Narosa Publishing House, New Delhi, 2002.

EC - 311
SEMICONDUCTOR DEVICES

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. ***Transistor characteristics*** **:** (10)
   Junction transistor, transistor current components ,current gain, transistor as an amplifier, common emitter, common base, common collector configurations, Input & output characteristics in CE,CB & CC configurations, photo transistor & its characteristics, unijunction transistor &its characteristics.

2. ***Transistor at low frequencies*** **:** (08)
   Graphical analysis of CE configuration two port devices and hybrid model, h-parameters, comparison of amplifier configurations. of circuits

3. ***Transistor biasing and Thermal stabilization*** **:** (08)
   Concept of biasing &biasing of BJT circuits, Operating point, bias stability, stabilization against variation in Ico, Vbe, and β, thermal run away, thermal stability.

Part-B

4. ***Field Effect transistor*** **:** (09)
   Junction field effect transistor , JFET characteristics, pinch off voltage and equivalent circuit , MOSFETS their modes of operation and characteristics, equivalent circuit , biasing of FETS.

5. ***Power amplifiers*** **:** (10)
   Classification of amplifiers, Class A large signal amplifier, second and higher harmonic distortion, transformer coupled amplifiers, Efficiency of amplifiers, Push pull amplifiers (class A & class B).

Books Recommended:

Integrated Electronics	Millman & Halkias (Mc-Graw Hill)
Microelectronic Circuits	AS Sedra & KC Smith (OXFORD)
Electronics Devices & Circuit Theory	RL Boylestead & L Nashelsky (PHI)
Electronic Circuit Analysis & Design	Donald A. Neamen (TMH)

EC - 361
SEMICONDUCTOR DEVICES LAB

L T P
0 0 2

External: 40
Sessional: 60

Note: At least eight experiments to be done.

1.. To study the specification sheet & draw the characteristics of transistor in CB or CE configuration.
2.. To study the specification sheet & draw the characteristics of FET in CD or CC configuration.
3.. To draw the frequency response of a single stage BJT amplifier.
4.. To measure the voltage and current gain of a BJT amplifier.
5.. To measure the distortion in the output of a push pull amplifier.

To simulate the following using P-spice

1. Frequency Response of a single state FET amplifier.
2. Voltage and current gain of BJT amplifier.
3. Distortion of a push pull power amplifier.

EE- 311
Linear Circuit Analysis

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

1. **Systematic Analysis Methods for Circuits with Independent and Controlled Sources**
   Independent and controlled sources, circuits with controlled sources, linearity and superposition, Thevnin and Norton networks.
   Nodal Analysis: Node voltages, matrix node equations, floating voltage sources
   Mesh Analysis : Mesh currents, matrix mesh equations, interior current sources.
   Applications of systematic analysis methods for analysis of ac circuits including unbalanced three phase circuits.
   [Carlson:1.2, 2.3-2.5, 4.1-4.4, 6.3, 6.5, 7.4] **(10-hours)**

2. **Fourier Series Analysis**
   Periodic Waveforms and Fourier Series: Periodic waveforms, trigonometric Fourier series, exponential Fourier series, waveform symmetry.
   Spectral Analysis of Periodic Waveforms: Line spectra, time and frequency relations, differentiation and integration.
   Spectral Circuit Analysis: Periodic steady state response. [Carlson:12.1-12.3]**(7-hours)**

3. **Two-Port Networks**
   Two-Ports and Impedance Parameters: Two-port concepts, impedance parameters, Reciprocal networks.
   Admittance, Hybrid and Transmission Parameters: Admittance parameters, hybrid parameters, transmission parameters, parameter conversion.
   Circuit Analysis with Two-Ports: Terminated two-ports, interconnected two-ports
   [Carlson:14.1-14.3] **(6-hours)**

PART-B

4. **Network Functions and s- Domain Analysis**
   Complex Frequency and Generalized Impedance: Complex frequency, generalized impedance and admittance, impedance analysis
   Network Functions: Network functions and circuit equations, network functions and impedance analysis.
   Network Functions with mutual Inductance.
   s-Domain Analysis: Poles and zeros, forced response and s-plane vectors, natural response and stability. [Carlson:10.1-10.4] **(8-hours)**

5. Laplace Transform Analysis

Solution of circuit differential equations using Laplace transform.

Transform Inversion: Partial fraction expansion, complex poles, repeated poles, time delay, initial and final values.

Transform Circuit Analysis: Zero-state response, natural response and forced response, zero input response, complete response.

Transform analysis with mutual Inductance.

Impulses and Convolution: Impulses, transforms with impulses, convolution and impulse response. [Carlson:13.1-13.5] **(10-hours)**

Text Book

1. A. Bruce Carlson, 'Circuits', Thomson-Brooks/Cole, 2002.

Other Recommended Books

1. W.H. Hayt, J.E. Kimmerely, and S. M. Durbin, 'Engineering Circuit Analysis', 6/e, McGrawHill, 2002
2. R.A. DeCarlo and P.M. Lin, 'Linear Circuit Analysis', Oxford, 2001
3. Charles K. Alexander, Mathew N. O. Sadiku, 'Fundamentals of Electric Circuits, 2/e, McGrawHill, 2004

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EE-361
Linear Circuit Analysis Lab

L T P
0 0 2

External: 40
Sessional: 60

1. To make 3-phase unbalanced network with neutral return of known impedance. Measure phase currents, neutral currents and the potential difference between the load and supply neutral. Verify the results theoretically.

2. To determine phase sequence of three phase supply system and to find the line currents for three phase three wire load when the sequence is i) RYB ii) RBY. Verify the results theoretically.

3. To study the current build up and current decay in RL / RC circuit by obtaining its response to a square wave input.

4. To check the polarity marking of a transformer and to determine self inductance of each winding and mutual inductance between the windings.

5. To study the resonance in R-L-C circuit, and to measure Q-factor of the coil.

6. To find the various two port network parameters (open circuit, short circuit, transmission and hybrid parameters)

7. For a circuit supplied from a non-sinusoidal source verify the following current and voltage relations:

   $V^2 = V^2_{dc} + V^2_1 + V^2_2 + \ldots\ldots$
   $I^2 = I^2_{dc} + I^2_1 + I^2_2 + \ldots\ldots$

8. To analyze a complex waveform.

9. To obtain capacitor voltage vs. time curve and time constant of an RC circuit when
   i) It is switched on to dc supply
   ii) Capacitor is discharged through the resistance

10. P Spice simulation of circuits to obtain steady state response for dc and ac excitation

11. PSpice simulation for transient response of circuits

12. PSpice simulation of unbalanced three phase circuits and for circuits with mutual inductance

CS-311
OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introduction to Object Oriented Methodology: (10)
Object Oriented Programming, Analysis, Class and Objects, Abstraction, Encapsulation Inheritance, Derived classes, types of inheritance, various types of classes, virtual functions and polymorphism, Overloading, Overriding,

OOP using C++ : (12)
Classes declaration and Memory Allocation, array of objects, Constructors and destructors, Pointers, Inheritance in C++, Polymorphism, operator & function overloading and type conversion, Overriding, Abstract Classes, I/O Streams, Templates, Generic Programming.

Part-B

Container Classes: (13)
Introduction to Arrays, Vectors, Stacks, Queues, Linked Lists and their different types, Trees, B-Trees, Heaps, Binary search Tree using Container Classes.

Algorithms: (10)
Complexity, Insertion sort; Selection sort; Merging; Merge sort; Radix sort; Sequential & Binary Search; Indexed Search; Hashing schemes;

Text Book:

C++ Programming Language By Bjarne Stroustrup, Third Edition, Pearson Publications.

Other Recommended Books:

Object Oriented Programming in Microsoft C++ by Robert Lafore, Galgotia publications, 2005

C++ Primer, 3/e, by Lippman, Pearson Publications.

Data Structures and Standard Template Library By Williams Collins, Tata Mcgraw Hill publications, 2003

Schaum's Outline of Data Structures with C++ By John R Hubbard, Tata Mcgraw Hill publications, 2000

CS-361
OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES LAB

L T P
0 0 2

External: 40
Sessional: 60

Programming exercises related to functions, classes, dynamic memory allocation, pointers, constructors, destructors, operator overloading, inheritance, virtual functions, polymorphism, I/O files, arrays, stacks, queues, prefix, infix, postfix notations, linked list, two way and circular link list, insertion, deletion, searching, sorting of data in link list, linked stacks and queues, trees representation, insertion, deletion and searching in trees, heap sort, binary and other types of trees, various searching and sorting algorithms and other topics related to theory portion.

EE- 312

ELECTRIC MACHINERY-I

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. **Transformers**

   Construction of transformer, Ideal transformer: Transformer polarity, Transformer ratings, Non-ideal transformer: Winding resistances, Leakage fluxes, Finite permeability, Phasor diagram, Equivalent circuit, Voltage regulation, Maximum efficiency criterion, Determination of transformer parameters: Open circuit and short circuit tests, Per unit computations, Autotransformer, Three-phase transformer: Y/Y, Delta/delta, Y/delta, Delta/Y connections, Analysis of three-phase transformer. Constant current transformers, Instrument Transformers: Current transformer, Potential transformer. [Guru-Hiziroglu: 4.1-4.12]. **(10 hours)**

2. **Direct Current Machines**

   Generators: Mechanical construction, Armature windings, Induced Emf equation, Developed torque, Magnetization characteristics, Theory of commutation, Armature reaction, Types of d.c. generators, Voltage regulation,

Losses, Separately excited, shunt, series and compound generators and characteristics, Maximum efficiency criterion.

Motors: Operation, Speed regulation, Losses, Series, shunt and compound motors, methods of speed control, Ward Leonard method, Braking or Reversing D.C. motors. [Guru-Hiziroglu: 5.1-6.11] **(10 hours)**

Part-B

3. **Polyphase Induction Machines**

Induction Motor: Construction**,** Principle of operation, Equivalent circuit, Power relations, Speed torque characteristics. Maximum power criterion, Maximum torque criterion and maximum efficiency criterion, Blocked rotor test, No-load test, Load test. Starting of induction motor, Rotor impedance transformation, Speed Control Methods: Frequency control, Changing stator poles, Rotor resistance control, Stator voltage control, Injecting an EMF in the rotor circuit..[Guru-Hiziroglu:9.1-9.14]

Induction Generator: Motor to generator transition, Induction generator starting and operation with other three phase sources, isolated generator operation and voltage build up. [Hubert: 5.18] **(15 hours)**

4. **Single Phase Induction Motors**

Double revolving field theory, Analysis of single phase induction motor and speed torque characteristics, Split Phase, Capacitor start, Capacitor start capacitor run motor, Permanent split capacitor motor, Shaded pole motor, Testing of single phase induction motor: No load and block rotor tests. [Guru-Hiziroglu: 10.1-10.4, 10.6-10.7]

(**8 hours**)

Text book:

1. B.S.Guru and H.R. Hiziroglu, 'Electric Machinery and Transformers', 3rd edition, Oxford, 2001.
2. Charles I. Hubert, 'Electric Machines', Pearson, 2002

Other Recommended Books:

1. A.E. Fitzgerald, C. Kingsley & D. S. Umans, 'Electric Machinery', 6th edition, McGraw-Hill, 2003.
2. S. Ghosh, 'Electrical Machines', Pearson, 2005.
3. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers

EE- 362
ELECTRIC MACHINERY-I LAB

L T P
0 0 3

External: 40
Sessional: 60

Note: At least eight experiments to be done.

1. Open circuit and short circuit test of single phase/ three phase transformer and obtain its equivalent circuit.
2. Parallel operation of two single phase transformers.
3. Back-to-back test on two single phase transformers.
4. Different winding connections of three phase two winding transformer and to identify proper combination for parallel operation.
5. Parallel operation of two three phase transformers.
6. Performance characteristic of a given dc shunt machine.
7. Performance characteristic of a given dc series machine.
8. Efficiency at different loads of the given dc shunt machine through swinburne / load test.
9. Speed control characteristics of a given dc shunt motor by (i) Armature control (ii) Field control.
10. No load and blocked rotor test on a three phase induction motor and to obtain its Equivalent circuit
11. Torque speed characteristics of three phase induction motor.

AS-306

INDUSTRIAL LAW AND ENTREPRENEURSHIP

L T P
3 0 0

External: 30
Sessional: 20

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Hours

PART - A

1. Introductory Review : **(3)**

Need, scope and characteristics of entrepreneurship. Entrepreneur and society, Nature of Entrepreneurial venture in India.

2. Contract Act: **(4)**

Definition & nature of Contract, offer and acceptance, revocation, consideration, capacity of parties and free consent.

3. Sale of Goods Act: **(3)**

Contract of sales of goods, conditions and warranties, transfer of ownership.

4. Negotiable Instruments Act: **(2)**

Types and parties to negotiable instruments.

PART - B

5. Financial Management: (6)

Sources of finance : Short term and long term, working capital requirements.

6. Companies Act: (6)

Formation of company. Types of companies. Company meetings; Shares, types of shares, Capital of Company.

SUGGESTED BOOKS :

1. Chawla, R.C. and Garg : Mercantile Law.
2. Pandey, I.M. : Financial Management.
3. Chawla and Garg : Industrial Law

BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
IV SEMESTER

Ref No.	Subject	SCHEDULE OF TEACHING				SCHEME OF EXAMINATION						
						THEORY				PRACTICAL		
		L	T	P	Total	Paper	Hrs.	Sess.	Total	Sess.	Viva-voce	Total
AS406	Numerical Analysis	3	1	-	4	100	3	50	150	-	-	-
CSE411	Database Management Systems	3	1	-	4	100	3	50	150	-	-	-
CSE461	Database Management Systems Lab	-	-	2	2	-	-	-	-	50	25	75
EE411	Power Systems-I	3	1	-	4	100	3	50	150	-	-	-
EE461	Power Systems-I Lab	-	-	2	2	-	-	-	-	50	25	75
EC411	Analog Electronics	3	1	-	4	100	3	50	150	-	-	-
EC461	Analog Electronics Lab	-	-	2	2	-	-	-	-	50	25	75
EC412	Theory of Electromagnetics & Antennas	3	1	-	4	100	3	50	150	-	-	-
EC413	Digital Electronics	3	1	-	4	100	3	50	150	-	-	-
EC463	Digital Electronics Lab	-	-	2	2	-	-	-	-	50	25	75
EE400	General Fitness	-	-	-	-	-	-	-	-	50	-	50
Total		18	6	8	32	600	-	300	900	250	100.	350

AS 406
Numerical Analysis

L T P
3 1 0

External: 100
Sessional: 50

Note for the paper setter: Total of 8 questions may be set covering the whole syllabus. Candidate will be required to attempt any 5 questions.

PART-A

Error analysis: Relative error, Absolute error, Round-off error, Truncation error, significant digits and numerical instability. (Scope as in Section 1.3, Chapter 1 of Reference 1).

(4 Lectures)

Transcendental and polynomial equations: Bisection method, Iteration Method based on first degree equation: Secant method, Regula-falsi method and Newton – Raphson methods, Rate of convergence of Secant method, Regula-Falsi method and Newton-Raphson Method. Bairestow's method to find quadratic factor of a polynomial (Scope as in corresponding topics in Section 2.3, 2.5, 2.9 of Chapter 2 of Reference 1)

(8 Lectures)

Interpolation: Polynomial interpolation: Finite differences, Lagrange and Newton interpolation, inverse interpolation, Hermite interpolation (Scope as in corresponding topics in Section 4.1-4.3, 4.5 of Chapter 4 of Reference 1) **(10 Lectures)**

PART-B

Solution of Linear Systems: Gauss elimination method, Gauss-Seidel method, Cholesky's Decomposition. Matrix inversion: Gauss-Jordan method. Eigenvalue problem: Bounds on Eigenvalues (Gerschgorin and Brauer theorems), Householder's method for symmetric matrices, Power method (Scope as in corresponding topics in Section 3.2, 3.4, 3.6, 3.9, 3.11 of Chapter 3 of Reference 1).

(10 Lectures)

Numerical Integration: Trapezoidal Rule, Simpson's 1/3 and 1/8 rule, Romberg integration, Newton – Coates formulae (Scope as in corresponding topics in Section 5.7, 5.8 of Chapter 5 of Reference 1).

(5 Lectures)

Numerical solutions of ordinary differential equations: Taylor's series, Euler and Runge – Kutta methods. Finite difference methods for boundary value problems (Scope

as in corresponding topics in Section 6.4 of Chapter 6 of Reference 1).

(5 **Lectures)**

Functional approximation: Chebyshev polynomials, Economization of power series, Least square approximation (Scope as in corresponding topics in Section 4.9 of Chapter 4 of Reference 1).

(3 **Lectures)**

References:

1. M. K. Jain, S. R. K. Iyenger, R. K. Jain. Numerical Methods for Scientific and Engineering Computation, Fourth edition New Age International Publishers, New Delhi 2004.
2. S. S. Sastry. Introduction Methods of Numerical Analysis Fourth Edition, Prentice Hall of India, New Delhi, 2005.
3. V. Rajaraman. Computer Oriented Numerical Methods Third Edition, Prentice Hall of India, New Delhi, 1980.
4. James B. Scarborough. Numerical Mathematical Analysis
5. C. F. Gerald, P. O. Wheatley. Applied Numerical Analysis, Sixth Edition, Pearson Education, Delhi, 2002.

CSE-411
DATABASE MANAGEMENT SYSTEMS

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Database System Concepts: **(10)**
Data Base Vs file oriented approach, Basic DBMS terminology, Data independence, General Architecture of a Data Base Management Software, Components of DBMS,

Data Base Design: **(10)**
Introduction to Data Models, Entity Relationship Model, Entities, Attributes, E-R Diagrams, Conceptual Design of a relational data base model, Data Normalization.

Part-B

Relational Approach: **(08)**
Relational Data Structure, Relational algebra, Relational Calculus.

Structured Query Language (SQL) **(08)**
Introduction to SQL, DDL, DML, DCL, Joins and Views, Transactions, Triggers and Cursors.

Security and Concurrency: **(09)**
Introduction to security and concurrency operations, Two-phase Commit and Locking protocols, Database protection, Data integrity.

Text Book:

Database Management Systems, 3rd Edition By Raghu Ramakrishnan, Madison and Johannes Gehrke By Tata Mcgraw Hill Publications, 2003

Other Recommended Books:

An Introduction top Database Systems By C.J.Date, Addison Wesley Publishing House, Latest Edition

CSE-461
DATABASE MANAGEMENT SYSTEMS LAB

L T P
0 0 2

External: 25
Sessional: 50

Exercises related to creating tables, creating a table with data from another table, inserting values into a table, updating column(s) of a table, deleting row(s) from a table, dropping a column, introduction to joins, views, manipulating the base table(s) through views, database security and privileges, grant command, revoke command, triggers, cursors and other topics related to theory portions

EE- 411
POWER SYSTEMS-I

L T P
3 1 0

External: 100
Sessional:50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Introduction

Introduction to Power System, Representation of power system components, One line diagram and impedance diagram, Per unit system, Complex power.

(4-hours)

2. Transmission-Line Parameters

Resistance, Conductance, Inductance: Solid Cylindrical Conductor, Inductance: Single-Phase Two-Wire Line and Three-Phase Three-Wire Line with Equal Phase Spacing, Composite Conductors, Unequal Phase Spacing, Bundled Conductors, Series Impedances: Three-Phase Line with Neutral Conductors and Earth Return,
Electric Field and Voltage: Solid Cylindrical Conductor
Capacitance: Single-Phase Two-Wire Line and Three-Phase Three-Wire Line with Equal Phase Spacing, Stranded Conductors, Unequal Phase Spacing, Bundled Conductors
Shunt Admittances: Lines with Neutral Conductors and Earth Return
Electric Field Strength at Conductor Surfaces and at Ground Level
Parallel Circuit Three-Phase Lines

[Glover-Sarma: 4.1-4.13] **(10-hours)**

3. Transmission Lines: Steady-State Operation

Medium and Short Line Approximations, Transmission-Line Differential Equations, Equivalent [pi] Circuit, Lossless Lines, Maximum Power Flow, Line Loadability, Reactive Compensation Techniques.

[Glover-Sarma: 5.1-5.7] **(8-hours)**

Part-B

4. Symmetrical Faults

Three-Phase Short Circuit--Unloaded Synchronous Machine, Power System Three-Phase Short Circuits, Bus Impedance Matrix and its formation.

[Glover-Sarma: 7.1-7.5] **(8-hours)**

5. Symmetrical Components

Definition of Symmetrical Components, Sequence Networks of Impedance Loads, Sequence Networks of Series Impedances, Sequence Networks of Three-Phase Lines, Sequence Networks of Rotating Machines, Per-Unit Sequence Models of Three-Phase Two-Winding Transformers, Per-Unit Sequence Models of Three-Phase Three-Winding Transformers, Power in Sequence Networks

[Glover-Sarma: 8.1-8.8] **(6-hours)**

6. Unsymmetrical Faults

System Representation, Single Line-to-Ground Fault, Line-to-Line Fault, Double Line-to-Ground Fault, Sequence Bus Impedance Matrices, Computer method of fault calculations.

[Glover-Sarma: 9.1-9.5] (8-hours)

Text Book

1. J. D. Glover, M. S. Sarma, 'Power System Analysis and Design'**,** Thomson-Brooks/Cole, 2002.
2. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis',Third Edition,TMH,2003

Other Recommended Books

1. D. Das, 'Electric Power Systems', New Age International, 2006.
2. A.R. Bergen and V.Vittal, 'Power System Analysis', Second Edition, Pearson, 2000.

EE- 461
POWER SYSTEMS-I LAB

L T P
0 0 2

External: 25
Sessional:50

Design/analysis projects relating to the following.

1. Determination of line parameters and sequence impedances of transmission lines.
2. Line loadability.
3. Steady state operation of transmission lines.
4. Symmetrical and Unsymmetrical power system faults.

EC- 411
ANALOG ELECTRONICS

L T P
3 1 0

External: 100
Sessional:50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Response of transistor Amplifier (09)

Review Biasing, classification of amplifier , distortion in amplifiers , frequency & phase response of an amplifier, RC coupled amplifier , its low and high frequency responses, transistor model at high frequencies for CE and Emitter follower configuration, high frequency response of two cascaded CE transistor stages

Feedback and Stability (8)

Introduction to feedback, Basic-Feedback Concepts, Ideal Feedback Topologies, Voltage(Series-Shunt) Amplifiers, Current(Series-Shunt) Amplifiers, Transconductance(Series-Series) Amplifiers, Transresistance(Shunt-Shunt) Amplifiers,

Operational Amplifier (08)

Differential Amplifier, Block diagram representation of a typical Op-amp, Interpreting of a typical set of data sheets, ideal op-amp, equivalent circuit. of op-amp, ideal voltage transfer curve, open loop op-amp configuration, the practical op-amp, input offset voltage, input bias current, input offset current, total output offset voltage, thermal drift, noise, common mode configuration, CMRR,. Frequency Response, Frequency response of internally compensated Op-Amps, Frequency response of Non-compensated OP-Amps, Open loop voltage gain as a function of frequency, Closed loop frequency response, Slew rate

Part-B

Op-amp Applications (10)

DC and AC Amplifiers, summing, Voltage–to-current converter, current to voltage converter, the Integrator, the Differentiator, Comparator, Zero-crossing detector, Voltage to frequency and frequency to voltage converters, Clippers and Clampers, Sample and Hold Circuit, Instrumentation Amplifier

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Active Filter ,Oscillators & Tuned Amplifiers (10)

Active filters, Essentials of Oscillator, Types of Oscillator, Sinusoidal Oscillator, Schmitt Trigger Circuits, Introduction of Tuned Amplifiers, Single & Double Tuned Amplifiers.

Book recommended

1 Electronics Circuit Analysis and Design by Donald A. Neamen, Tata McGraw Hill

2 Op-Amps and Liner integrated Circuits by Ramakant A. Gayakward, 4th edition, Pearson Education Asia Low price Edition

3 Integrated electronics by Millman & Halkias

4 Operational Amplifiers by B B Brey.

EC - 461
ANALOG ELECTRONICS LAB

L T P
0 0 2

External: 25
Sessional:50

Note: At least eight experiments to be done.

1 To study the Pspice Simulation software

2 Design fabrication & testing of Differentiator Circuits using Op-Amp & simulate using P-spice

3 Design fabrication & testing of Integrator Circuits using Op-Amp & simulate using P-spice

4 Design fabrication & testing of adder/Subtractor Circuits using Op-Amp & simulate using P-spice

5 Design fabrication & testing of Clippers and Clampers Circuits using Op-Amp & simulate using P-spice

6 Design fabrication & testing of Universal Active filter & simulate using P-spice

7 To study the frequency response of OP-Amp & simulate using P-spice

8 To design Butter worth Low pass filter & simulate using P-spice

9 To design Butter worth High pass filter & simulate using P-spice

10 To design Butter worth Band pass filter & simulate using P-spice

11 To design Monostable & Free running Multivibrator using 555

EC - 412
THEORY OF ELECTROMAGNETICS AND ANTENNAS

L T P
3 1 0

External: 100
Sessional:50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. **Maxwell's equation**:
   Review of Maxwell's equations in their integral and differential forms,
   Maxwell's equations in free space and in harmonically varying fields. Physical Interpretation (03)

2. **Plane waves in Dielectric and Conducting Media**:
   Conductors and Dielectrics, Wave equations in conducting and dielectric media its solution, Skin effect, relaxation time, impedance of the conducting medium. Reflection and transmission of the wave at a boundary. Pointing Vector application to energy radiation ,Velocities of propagation: group velocity, phase velocity, poynting vector ,wave polarization. (12)

3. **Guided Waves**:
   Waves between parallel planes, TEM waves, Field analysis of T.M. & T.E. wave, Characteristics of T.M. & T.E. Waves. (06)

Part-B

4. **Wave Guides**:
   Rectangular and Circular waveguides:T.M. & T.E. Modes ,Wave impedance and characteristics impedances, Attenuation factor and Q of waveguides. (08)

5. **Antenna:**
   Antenna Parameters, Radiation field, Radiation power and Radiation resistance of alternating current element and dipole antenna. One dimensional Broad side and End Fire arrays, muti plication of patterns. VLF and LF Transmitting Antennas: Effect of Earth on vertical patterns and radiation resistance, grounding, effective length, top loading and tuning, (10)

6. **Wave Propagation:**
   Modes of Propagation: Surface Wave Propagation, Sky Wave (Ionospheric) Propagation- Virtual height, Maximum usable Frequency, Skip Distance,

Optimum working frequency, Space Wave (Tropospheric) Propagation- line of sight distance, Effective Earth's radius, Duct propagation (09)

Books Recommended:

1. Electromagnetic Waves & Radiation System by E.C. Jordan & K. G. Balmain.
2. Electromagnetic by Kraus
3. Antennas and Wave Propagation by G S N Raju, Pearson publications
4. Antennas and Radio Wave Propagation by K D Prasad Satya Prakashan
5. Antenna and Radio Wave Propagation Collin R.E. Mc-Graw Hill.

EC - 413
DIGITAL ELECTRONICS

L T P
3 1 0

External: 100
Sessional:50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

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Part -A

Introduction (10)

Concept of digitisation, Representation of Logic, Logic Variables, Boolean Algebra, Boolean Expressions and minimization of Boolean expression using K-Map(up to five variables), Review of Logic Gates, design & Implementation of Adder, Subtractor, Multiplexer, DeMultiplexer, Encoder, Decoder, ROM, Digital Comparators, Code Converters using gate, multiplexers / decoders

Flip-Flops (04)

A 1- bit memory cell, clocked & unclocked flip flop, S-R Flip-Flop, JK Flip-Flop, Race around Condition , Master Slave Flip-Flop, D&T type Flip-Flop

Counters & Shift Registers (10)

Ripple Counters, Design of Modulo-N ripple counter ,Presettable Counters, Up-Down counter, design of synchronous counters with and without lockout conditions, design of shift registers with shift-left, shift-right & parallel load facilities, Universal shift Registers.

Part -B

(06)

Data Converters

Sample & Hold switch, D/A converters: weighted resistor type, R-2R Ladder type; A/D Converters: Counter-Ramp type, Dual Slope Type, Successive approximation type, flash type; Specifications of ADC & DAC

Digital Logic families (05)

Characteristics of digital circuits: fan in, fan-out, power dissipation, propagation delay, noise margin; Transistor-transistor Logic(TTL), manufacturer Data Sheets & Specifications, Types of TTL Gates (Schottky, standard, low power, high speed). Emitter Coupled Logic(ECL), Manufacturers Data sheets & Specifications, Comparison of Characteristics of TTL and ECL, Tristate Logic & its applications.

Semiconductor Memories & Programmable Logic (10)

ROM, PROM, EPROM, EEPROM; RAM: Static RAM, Typical Memory Cell, Memory Organisation, Dynamic RAM cell, Reading, & Writing Operation in RAM, PLA, PAL & FPGA

Books Recommended

1 Digital Electronics by **Taub Schilling**

2 Integrated Electronics by **Millman & Halkias**

3 Digital System Principles & Applications by **R J Tocci** (PHI)

4 Digital Logic Design By **Morris Mano**

EC - 463
DIGITAL ELECTRONICS LAB

L T P
0 0 2

External: 25
Sessional:50

Note: At least eight experiments to be done.

1 To Study the data sheets of TTL and ECL gates

2 Verify the truth tables of with various gates, RS, D, JK Flip Flops

3 To design and implement a Modulo-N Counter

4 To Design and implement a Universal shift register

5 To Perform arithmetic & Logic operations on two 4-bit binary numbers using an ALU.

6 To Transfer the Data between Three Registers through Tristate Circuit

7 To Understand Decoder/Driver and their applications with display. To display a count from 00 to 99 with a delay of N seconds.

8 Design & fabrication of synchronous counter.

9 Design & fabrication of Combinational circuits using Multiplexers.

10 To convert 8 bit Digital data to Analog value using DAC

11 To convert Analog value into 8 bit Digital data using ADC

BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
V SEMESTER

Ref No.	Subject	SCHEDULE OF TEACHING				SCHEME OF EXAMINATION						
						THEORY				PRACTICAL		
		L	T	P	Total	Paper	Hrs.	Sess.	Total	Sess.	Viva-voce	Total
EE-511	Power Systems-II	3	1	-	4	100	3	50	150	-	-	-
EE-561	Power Systems-II Lab	-	-	3	3	-	-	-	-	50	25	75
EE-512	Electric Machinery-II	3	1	-	4	100	3	50	150	-	-	-
EE-562	Electric Machinery-II Lab	-	-	3	3	-	-	-	-	50	25	75
EE-513	Microprocessors and Interfacing	3	1	-	4	100	3	50	150	-	-	-
EE-563	Microprocessors and Interfacing Lab	-	-	3	3	-	-	-	-	50	25	75
EE-514	Instrumentation Systems	3	1	-	4	100	3	50	150	-	-	-
EE-564	Instrumentation Systems Lab	-	-	3	3	-	-	-	-	50	25	75
CSE-511	Computer Networks	3	1	-	4	100	3	50	150	-	-	
EE-560	Seminar	-	-	3	3	-	-	-	-	100	-	100
EE-564	Vocational Training of Fourth Semester	-	-	-	-	-	-	-	-	100	-	100
Total		15	5	15	35	500	-	250	750	400	100	500

EE- 511
Power Systems-II

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1 Power System Protection

System Protection Components, Instrument Transformers, Overcurrent Relays, Radial System Protection, Reclosers and Fuses, Directional Relays, Protection of Two-Source System with Directional Relays, Zones of Protection, Line Protection with Impedance (Distance) Relays, Differential Relays, Bus Protection with Differential Relays, Transformer Protection with Differential Relays, Pilot Relaying, Digital Relaying

Power System Overvoltages, protection against over voltages by shielding or ground wires and lightning arrestors, insulation coordination. (**13h)**

2. Circuit Breakers

Transient recovery voltage, resistance switching, first pole to clear factor, Transient recovery voltage, arc and arc extinction, volt ampere characteristics of arc, methods of arc extinction, construction, working and applications of air-break circuit breakers, oil circuit breakers, vacuum circuit breakers, air blast circuit breakers, SF6 circuit breakers, circuit breaker ratings. (10 h)

PART-B

3. Substations and Distribution

Location and types of substations, bus-bar arrangements, major substation equipment

Types of insulators, voltage distribution across suspension insulators, string efficiency, methods of improving string efficiency

Types of Underground cables, capacitance of single core cables, grading of cables, capacitance of three core belted cables, power factor and heating of cables

Radial, parallel or loop, network or grid types of distribution systems and their relative merit. (10 h)

4. Grounding

Grounding fundamentals, Ground resistance, step voltage, touch voltage and transferred voltage, tolerable step and touch voltages, ground resistance of a

hemisphere and driven rod, IEEE Standard 80 formulae for ground resistance and step and mesh voltages of a grounding grids, limitations of the formulae.

Neutral grounding: ungrounded systems, resonant grounding, solid or effective grounding, reactance grounding, earthing transformer, neutral grounding practice. (8 h)

Text Book / Standards

1. J. D. Glover, M. S. Sarma, 'Power System Analysis and Design**',** Thomson-Brooks/Cole, 2002
2. I. J. Nagrath, D. P. Kothari, Power System Engineering, TMH, 1994
3. IEEE Guide for Safety in AC Substation Grounding, ANSI/IEEE Std. 80-2000, 2000

Other Recommended Books

1. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', PHI, 2003.
2. Weedy & Cory, Electric Power Systems, John Wiley & Sons, 1999
3. IS:3043 -1987, Indian Standard Code of Practice for Earthing, BIS, New Delhi, 1987
4. Y. G. Paithankar and S. R. Bhide, Fundamentals of Power System Protection, PHI, 2003

EE- 561
POWER SYSTEMS II LAB

Note: At least eight experiments / projects / technical reports relating to the following:

1. Measurement of soil resistivity and soil model evaluation
2. Measurement of ground resistance.
3. Grounding system design for a substation.
4. To study the characteristics of over current relay.
5. To study the characteristics of percentage differential relay.
6. To study the characteristics of distance relay.
7. To study current time characteristics of fuses.
8. Technical visit to a substation/generating station, Load Dispatch Centre and preparation of a technical report for the same
9. Conventional and renewable energy sources
10. Distribution system design
11. Digital relaying
12. Reactive compensation of lines

EE- 512
ELECTRICAL MACHINERY-II

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Synchronous Machines: **(18)**

Introduction, basic synchronous Machine Model (Realistic Machine), Voltage regulation, Circuit model of synchronous machine, determination of synchronous reactance, Open circuit characteristic(OCC), short circuit characteristic (SCC), Short circuit ratio (SCR), short circuit loss, Determination of armature Reaction, ampere-turns and Leakage reactance of a synchronous machines-Potier method, Nature of armature reaction, salient pole synchronous machine-two reaction model, analysis of phasor diagram, power angle characteristic, determination of Xd and Xq using slip test, V-curve, Inverted V-curve of synchronous machine, hunting in synchronous machines, damper winding, short circuit transients in synchronous machine, short circuit under loading conditions, single phase synchronous generators, synchronous condenser.

Part-B

Parallel operation of alternators: **(12)**

Synchronizing to infinite Bus-Bars, synchronoscope, parallel operation of alternators, Operating characteristics, generating Machine, motoring machine, power angle characteristic, operation at constant load with variable excitation, generating Machine, motoring machines, minimum excitation, observation, compounding curve, synchronous condenser, consideration of armature resistance, power flow (transfer) equations,

Special motors: **(10)**

Brushless dc motors, schematic and operation, circuit model characteristics of brushless dc motor, PM Brushless dc machine, universal motor and stepper motor, linear induction motor, Hysteresis motor, reluctance motors

Text Books:

1 I.J Nagrath, D.P. Kothari, Electrical Machines, TMH Publishing Company, 2002.

2. P.S. Bhimbhra, Electrical Machinery, Khanna Publishers, 2003.

Other Recommended Books:

1 Electrical Machinery and Transformers by Bhag S. Guru and Huseyin R. Hiziroglu,

2.New York Oxford University Press 2004 Electrical Machines by Smarjit Ghosh, Pearson Education Singapore PTE. Ltd. 2005.

3. Electric Machinery by A.E. Fitzgerald, Kingsley, Umans, TMH Publishing Company, 2002

EE- 562
ELECTRICAL MACHINERY-II LAB

L T P
0 0 3

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

1. To perform no load test on a 3 phase alternator (cylindrical rotor).
2. To perform short circuit test on a 3 phase alternator (cylindrical rotor). Measure the resistance of stator winding of alternator. Find out regulation of alternator at full load at (i) unity power factor (ii) 0.85 Power factor lagging (iii) 0.85 Power factor leading using synchronous impedance method.
3. To synchronize an alternator with the 3 phase supply.
4. To perform the parallel operation of two alternators.
5. To perform the slip test to determine the Xd and Xq.
6. To run a stepper motor in different modes with the help of microprocessor.
7. To analyze the power factor improvement of an industry and design the capacitor bank.
8. Computer aided transformer design
9. Computer aided induction machine design
10. Computer aided synchronous machine design
11. To obtain positive, negative and zero sequence impedances of a three phase synchronous generator
12. To obtain positive, negative and zero sequence impedances of a three phase transformer

EE- 513
Microprocessors and Interfacing

L T P
3 1 0

External: 100
Sessional: 50
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Microprocessor Architecture and Microcomputer Systems; Microprocessor Architecture Memory, Input and Output Devices, The 8085 MPU, Example of an 8085-Based Microcomputer, Memory Interfacing. (4 h)
Interfacing I/O Devices: Basic Interfacing Concepts, Interfacing Output Displays, Interfacing Input Devices, Memory- Mapped I/O, Testing and Troubleshooting, I/O Interfacing Circuits. (4 h)
Programming the 8085: Introduction to 8085 Assembly Language Programming, The 8085 Programming Model, Instruction Classification, Instruction Format. Data Transfer (Copy) Operations, Arithmetic Operations, Logic Operations, Branch Operations, Writing Assembly Language Programs. (5 h)
Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Operations Related to Memory, Logic Operations. (4 h)

Part-B

Counters and Time Delays: Counters and Time Delays, Hexadecimal Counter, Modulo Ten, Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs. (4 h)
Stack and Subroutines: Stack, Subroutine, Conditional Call and Return Instructions. (2 h)
Interrupts : The 8085 Interrupt, 8085 Vectored interrupts. (2 h)

Interfacing Data Converters: Digital- to- Analog (D/A) Converters, Analog- to- Digital (A/D) Converters, stepper motor interfacing (4 h)
General –Purpose Programmable Peripheral Devices: The 8255A Programmable Peripheral Interface, Illustration: Interfacing Keyboard and Seven- Segment Display, Illustration : Bi- directional Data Transfer between Two Microcomputers, The 8254 Programmable Interval Timer, The 8259 A Programmable Interrupt Controller, Direct Memory Access (DMA) and the 8257 DMA Controller, serial communication, Programmable communications interface 8251,RS 232C. (6 h)

TEXT BOOK

Ramesh S.Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”

OTHER RECOMMENDED BOOKS:

Badri Ram, “Advanced Microprocessors & Interfacing”, Tata MC Graw Hill.
Charles M.Gilmore, “Microprocessor Principles and Applications”, TMH.
Douglas V. Hall, “Microprocessors and Interfacing programming and Hardware” TMH.

EE-563
MICROPROCESSORS AND INTERFACING LAB

L T P
0 0 3

External: 50
Sessional: 25
Note: Attempt any **ten** programs..

1. Study of 8085 Microprocessor kit
2. Write Assembly Language Program to add n given numbers with and without carry.
3. Write Assembly Language Program to count positive & negative numbers in given n numbers.
4. Write Assembly Language Program to de-assemble 8- bit number in two nibbles.
5. Write Assembly Language Program to reassemble two nibbles in 8- bit number.
6. Write Assembly Language Program to sort given n numbers in ascending & descending order using subroutine.
7. Write Assembly Language Program to relocate the given numbers in same & reverse order.
8. Write Assembly Language Program to Flash different letters using your own delay subroutine.

Inter facing of Microprocessor 8085:

1. To obtain a square wave on CRO
1. To interface A to D converter
2. To interface D to A converter
3. To interface input/output module for complementing the input data.
4. To interface stepper motor with µp to control its step size and direction of rotation
5. To develop a traffic light controller program and interface using Input/Output Module.

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EE- 514
Instrumentation systems

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

1) Transducers & Standards

Standards of Instrumentation Systems and Their Classification: Emf, Current, Resistance and Capacitance Standards. Sensors and Transducers: Primary Sensing Elements; Characteristics; Classification.

Passive-Transducers-Resistive, Inductive, Capacitive; Types, Features, Configurations, Analysis, Applications.

Active Transducers- Thermoelectric, Electromagnetic, Piezo-Electric, Photoelectric; Types-Principle, Construction, Analysis and Applications.

2) Digital - Analog Instruments and Recording Systems

Data Telemetry: Digital Instruments - Block Diagram Of Digital Multimeters, Storage Oscilloscope - Magnetic Tape Recorders - Direct Recording, Frequency Modulation Recording, Digital Recording Technique - Floppy Discs -Digital Input - Output Devices.

PART-B

3) Signal Conditioning:

Analog Conditioning- Instrumentation and Logarithmic Amplifiers.

Digital Conditioning-A/D, D/A Converters-Common Types, Operation.
Types-Analog/Digital, Block Diagram, Operation, Comparative Performance
(Data Display and Recording Devices: Principle, Operation and Use of -LEDs, LCDs, Recorders-Paper Chart, Magnetic Tape, Semi-Conductor;

4) Virtual Instrumentation

Introduction to lab VIEW Front Panel, Block Diagram, Tools And Palettes, Menus, Code Debugging, Creating Sub-Vis, For Loop, While Loop, Structures, Arrays And Clusters, Graphs And Charts, File Input And Output , Data acquisition and applications.

TEXT-BOOK

1. W.D. Cooper and A.D. Hilfrick: Electronic Instrumentation &

Measurement Techniques, PHI.

2 .A.K Sahnwey “Electronic and Electrical Instrumentation”.

3. R.H.Bishop, Learning with LabVIEW 7 Express,Pearson Education, Delhi.

References:

1. Murthy, D.V.S. - Transducers Instrumentation
2. Doeblin, E.O.-Measurement Systems (MGH)

EE- 564
Instrumentation systems Lab

L T P
0 0 3

External: 25
Sessional: 50

Note : At least eight experiments are to be performed.

1) Displacement measurement using LVDT
2) To study the operation of Instrumentation Amplifier.
3) Measurement of flow using electromagnetic and positive displacement parameters.
4) Measurement of level using capacitance probe differential pressure transducer.
5) Design of linearization circuit for thermistor.
6) Experiments based on Lab VIEW.

CSE-511
COMPUTER NETWORKS

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

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Part-A

Introduction **(6)**

Data Transmission concepts; switching; Modulation; multiplexing; Network Hardware: LAN, MAN, WAN, Wireless Networks, Internet works; Network Software: Layer, Protocols, interfaces and services; Reference Model: OSI, TCP/IP and their comparison.

Physical Layer **(10)**

Transmission media: Magnetic, Twisted pair, coaxial cable, fibre optics, wireless transmission. Circuit Switching & Packet Switching. Introduction to Cellular radio and communication satellite.

Data Link Layer **(10)**

Framing; Error control; Error Correction & Error Detection; Sliding window protocols; Examples of DLL Protocols – HDLC,SLIP, PPP ; Medium Access Sub Layer: Channel Allocation, MAC protocols – ALOHA,CSMA protocols, Collision free protocols, Limited Contention Protocols , Wireless Protocols , IEEE 802.3,802.4,802.5 standards and their comparison. Bridges: Transparent, source routing, remote.

Part-B

Network Layer **(8)**

Design issues, routing algorithms (shortest path, flooding, flow based, distance vector, hierarchical, broadcast, multicast, for mobile host). Introduction to Congestion control algorithms.

Transport Layer **(5)**

Addressing, establishing and releasing connection, flow control & buffering, multiplexing, crash recovery, Internet Transport protocol (TCP and UDP).

Application Layer **(6)**

Basics of Network security, Domain Name System, Introduction of Simple Network Management Protocol, Electronic mail and FTP.

Text Books

1. Computer Networks Andrew S. TanenBaum (PHI)
2. Data Communications and Networking, 3/e Behrouz A Forouzan (Mcgraw-hill)

Other Recommended Books

1. Data and Communication William Stallings (PHI)
2. Data & Computer Communication Douglos E. Coomer (Addison Wessl

BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
VI SEMESTER

Ref No.	Subject	SCHEDULE OF TEACHING				SCHEME OF EXAMINATION						
						THEORY				PRACTICAL		
		L	T	P	Total	Paper	Hrs.	Sess.	Total	Sess.	Viva-voce	Total
EE-611	Control Engg	3	1	-	4	100	3	50	150	-	-	-
EE-661	Control Engg Lab	-	-	3	3	-	-	-	-	50	25	75
EE-612	Power Electronics and Drives	3	1	-	4	100	3	50	150	-	-	-
EE-662	Power Electronics and Drives Lab	-	-	3	3	-	-	-	-	50	25	75
EE-613	Computer Aided Power System Analysis	3	1	-	4	100	3	50	150	-	-	-
EE-663	Computer Aided Power System Analysis Lab	-	-	3	3	-	-	-	-	50	25	75
EE-614	Microcontrollers, PLCs and Applications	3	1	-	4	100	3	50	150	-	-	-
EE-664	Microcontrollers, PLCs and Applications Lab	-	-	3	3	-	-	-	-	50	25	75
EC-611	Electronics Systems Design	3	1	-	4	100	3	50	150	-	-	-
EC-661	Electronics Systems Design Lab	-	-	3	3	-	-	-	-	50	25	75
EE-600	General Fitness	-	-	-	-	-	-	-	-	125	-	125
Total		15	5	15	35	500	-	250	750	375	125	500

EE- 611
CONTROL ENGINEERING

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introductory Concepts: Open loop and closed loop control systems, Servomechanisms, feedback and effects of feedback, linear and non- linear systems, time variant & invariant, continuous and sampled data control systems, illustrative examples.

Modelling: Mathematical models of linear electrical, mechanical, translational, rotational, gear, thermal, pneumatic and hydraulic systems, electrical and mechanical analogies. Laplace transforms Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

State Space Analysis: Concepts of state variable, state vector and state space, State space representation, solution of state equation for LTI and LTV systems, state transition matrix.

Time Domain Analysis: Typical test-input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and error co-efficient,

Stability: Concepts of absolute and relative stability, pole –zero location, Routh-Hurwitz stability criterion.

Part-B

Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain & sketch of the root locus plot.. Rules for construction of root locus, root contours, root sensitivity, generalized root locus.

Frequency Domain Analysis: Closed loop frequency response, Relation between time and frequency response for second order systems. Frequency response specification, Bode plots, stability and loop transfer function. Polar Plot, Nyquist criterion, Gain Margin and Phase Margin. Nichol's chart, M and N circles.

Control Components: Error detectors- potentiometers and synchros, a.c. and d.c. servo motors, brushless d.c. motors, A.C. and D.C. techogenerators, stepper motors.

RECOMMENDED BOOKS:

Control System Engineering by I.J. Nagrath & Gopal, New Age International (P) Limited , New Delhi,3rd edition ,2004

Modern Control Engineering by K. Ogata, Pearson Education, New Delhi,3rd Indian Reprint Edition,2004

Automatic Control System by B. C. Kuo. Prentice Hall of India, Seventh Edition.

EE-661
CONTROL ENGINEERING LAB.

L T P
0 0 3

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

1. To study the input-output characteristics of a potentiometer and to use a potentiometer as an error detector.
2. To study transmitter - receiver characteristics of a synchros set and to use the set as control component.
3. To study the operation of d.c. position control system.
4. To study the operation of d.c. speed control system.
5. To design different compensating networks for the given cut off frequency response.
6. To study PID controller and to obtain the effect of proportional, Integral and derivative control action.
7. To study the MATLAB Programming for controls systems related to steady state and transfer function conversions.
8. To obtain the step and ramp input response for the various transfer functions using MATLAB.
9. To obtain the root locus response for different systems using MATLAB.
10. To obtain response of basic control system problems in SIMULINK and tune them in MATLAB.
11. To run and use SIMULINK based models in MATLAB.To analyze and simulate the models of following real time applications in MATLAB:
12. Missile System.
13. Sun-seeker System
14. D.C. motor Control.

EE- 612
POWER ELECTRONICS AND DRIVES

L T P
3 1 0

External: 100
Sessional: 50
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Thyristor and Semiconductor Power Switching Devices (12)

Devices of Thyristor family and their V-I characteristics: Thyristor, Diac, Triac, GTO, MOSFET, IGBT, Principle of operation of SCR. Turn on methods of a Thyristor, Switching characteristics of Thyristor during turn-on and turn-off, Gate characteristics, Thyristor triggering and commutation circuits

Series and parallel operation of SCR's, Thyristor specifications (latching current and holding current, dv/dt and di/dt etc.), Thyristor Protection circuits, UJT: characteristics and as a relaxation oscillator.

Phase controlled Rectifiers (5)

Principle of phase angle control, Single phase & three phase full controlled bridge rectifiers for R and R-L –E loads with and without freewheeling diode. Dual Converter, circulating and non-circulating current modes of operation.

Choppers **(5)**

Principle of chopper operations, Control strategies, types of chopper (A, B, C, D, and E), and voltage commutated chopper or classical Jones chopper, Morgan chopper.

Part-B

Inverters **(5)**

Single-phase and three phase inverters, 180-degree and 120-degree conduction, PWM inverters, Series and parallel inverters, Mc-Murray Bedford inverters.

Cycloconverters **(3)**

Single phase bridge cycloconverter. Three phase to single phase, single phase to single phase cycloconverter. Advantages disadvantages of cycloconverter.

D C and A C Drives **(6)**

Single-phase and three-phase Converter Drives. Chopper Drives, Induction Motor Drives, Industrial applications of DC and AC Drives, Microprocessors in the control of Electrical Drives.

Facts Devices **(4)**

FACTS Technology, objectives, types of controllers, FACTS Devices: STATCOM, SSG, SVG, UPFC and SSSC.

Text Books

P.S. Bimbhra, Power Electronics, Khanna Publishers, 2003.

Power Electronics by C.W. Lander, Mc-Graw Hill book Company, Singapore (1993)

Other Recommended Books

Mohammed H. Rashid, power Electronics- circuits, Devices and applications, PHI New Delhi, 2001

M.D. Singh, K.B. Khanchandani, Power Electronics, Tata Mc Graw Hill Publishing company.

Vedam Subrahmanyam, "Thyristor Control of Electric Drives", New Delhi,1998

EE –662
POWER ELECTRONICS AND DRIVES LAB

L T P
0 0 3

External: 25
Sessional: 50
Note: At least eight experiments are to be performed.

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1. To plot the V-I characteristics of the SCR.
2. To draw V-I characteristics of Triac.
3. Study of SCR triggering circuits and check the performance of UJT as triggering device.
4. Study of SCR commutation circuits and check the performance of one commutation circuit.
5. Study of Jones chopper or any chopper circuit to check the performance.
6. Thyristorised speed control of a D.C. Motor.
7. Speed Control of induction motor using Thyristor.
8. Study of series inverter and Mc Murray half-bridge inverter and check their performance.
9. Study of the microprocessor based firing control of a bridge converter.
10. Design and simulation of following Thyristor circuits using PSCAD / MATLAB software.
    i. commutation,
    ii. chopper,
    iii. invertors,
    iv. rectifier
    v. UJT as triggering circuit
    vi. Speed control of motors.

EE- 613
Computer Aided Power Systems Analysis

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3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. **Power Flow Studies**
   The Power-Flow Problem, Power-Flow Solution by Newton-Raphson method, Power-Flow Solution by Gauss-Seidel Method, Control of Power Flow, Methods of reducing Sparsity. 10 h

2. Power System Controls

Generator-Voltage Control, Turbine-Governor Control, Load-Frequency Control (single area and two area case), Economic Dispatch, Introduction to Optimal Power Flow. 10h

Part- B

3. Transient Stability Studies
Introduction of power system stability, The Swing Equation, Simplified Synchronous Machine Model and System Equivalents, Stead state stability, Transient stability, The Equal-Area Criterion for sudden change in mechanical input, sudden loss of one parallel lines, sudden short circuit on one parallel lines and effect of clearing time on stability, Numerical Integration of the Swing Equation, Design Methods for Improving Transient Stability. 18 h

Text Book

1. J. D. Glover, M. S. Sarma, '**Power System Analysis and Design',** Thomson-Brooks/Cole, 2002.
1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, TMH,2003

Other Recommended Books

1. Hadi Sadat, Power System Analysis, Tata McGrawHill 2002
2. A.R. Bergen and V.Vittal, 'Power System Analysis', Second Edition, Pearson, 2000.
3. Grainger & Stevenson, 'Power System Analysis' Tata McMcGraw-Hill 2000.

EE- 663
Computer Aided Power Systems Analysis Laboratory

L T P
0 0 3

External: 25
Sessional: 50

Note: At least four design / analysis projects relating to the following.

1. Power flow analysis.
2. Power flow control
3. Economic dispatch
4. Transient stability studies.
5. Load frequency control

EE -614
Microcontroller, PLCs and Applications

L T P
3 1 0

External: 100
Sessional:50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introduction: Micro controller, Comparison of Microprocessor and Micro controller, micro controller and embedded processors. 2 h

The 8051 Architecture: 8051 Micro controller hardware, Input/Output Pins, Ports, and Circuits, External memory, Counter & timers, Serial Data Input/Output, Interrupts 6 h

8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program. Data Types and directives. Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Jump loop and call instructions, I/O Port programming, Timer/counter programming in the 8051 8 h

Serial Communication: 8051 connection to RS 232, 8051 serial communication Programming. 3 h

Part-B

Real World Interfacing: LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory 7 h

Introduction to PLC: Introduction to Process Control & Automation, PLC as a Computer ,PLC CPU, Solid State Memory, CPU Processor, I/O Modules, PLC-Advantages & Disadvantages. 5 h

General PLC programming: Introduction, Programming Equipment, Program Format, Construction of Ladder Diagrams 4 h

Programming ON-OFF Inputs to produce ON-OFF Outputs: PLC Input Instructions, Outputs Coil Indicators& others, Operational procedures, Contact & Coil Input/Output Programming Examples, Industrial Process Example. 5 h

Recommended Books:

The 8051 Microcontroller Architecture,Programming & application,by Ayala

The 8051 Microcontroller and embedded Systems by: - Ali Mazidi

An embedded software primer, David e Simon, Pearson Education

Programmable logic controllers Principles & applications,John W.Webb, Prentice Hall

EE-664
Micro Controller, PLCs and Applications Lab

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External: 25
Sessional: 50

List of Experiments:

Note: At least **eight** experiments to be done selecting at least two from the last eaxperiment.

1. Study of 8051/8031 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a program to check a number for being ODD or EVEN and show the result on display.
5. Write a program to split a byte in two nibbles and show the two nibbles on display.
6. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
7. Write a program to find a factorial of a given number.
8. Write a program to show the use of INT0 and INT1.
9. Write a program of Flashing LED connected to port 1 of the Micro Controller
10. Write a program to generate a Ramp waveform using DAC with micro controller.
11. Write a program to interface the ADC.
12. Write a program to control a stepper motor in direction, speed and number of steps.

Write Ladder programs (at least two) using PLC for control of simple industrial Processes**.**

EC- 611
ELECTRONIC SYSTEMS DESIGN

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

COMBINATIONAL CIRCUITS **(17)**

Review of switching algebra: Definitions Theorems, Functions of n variable, Logic Detailed Diagram and Symbols minimization, Minimization Techniques: optimal combinations with K-map and tabular methods, simplification & minimization, complimentary approach with map method, map method for multi-output functions, Tabular and Iterative consensus method for obtaining prime implicants and for multi output functions.

Error Correction and Detection: Error detection and correction techniques, Single error detection, Single error correction with double error

VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.

PART-B

FAULTS **(05)**

Fault detection and Location in combinational circuits: Different methods of detecting and locating Faults in combinational circuits.

SEQUENTIAL CIRCUITS **(18)**

VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

FAULTS **(05)**

Fault detection and Location in sequential circuits.

TEXT BOOKS

Digital circuits and Logic Design By Lee
Switching and Finite Automata Theory, Kohavi
A VHDL Primer, Bhasker; Prentice Hall

OTHER RECOMMENDED BOOKS

Computer Logic Design, Morris Mano
Switching circuits for Engineers, Marcus

Introduction to Digital systems, James Palmier, David Perlman
Digital System Design using VHDL, Charles. H. Roth; PWS
VDHL-Analysis & Modelling of Digital Systems. Navabi Z; McGraw Hill
VHDL-IV Edition:Perry; TMH
Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic; TMH

EC -661
ELECTRONIC SYSTEMS DESIGN LAB

L T P
0 0 3

External: 25
Sessional: 50
Note:. At least eight experiments are to be performed.

List of Experiments:

1. To Design and test the minimized circuit of Full Adder.
2. To Design and test the minimized circuit of BCD to Binary Converter
3. Implement decade counter using minimum number of gates
4. To test the minimized circuit of Decimal to BCD Encoder
5. Design and test hexadecimal to binary Encoder
6. Implement and test BCD TO 7-Segment decoder
7. Design a sequence detector to detect a given sequence
8. Design and test twisted type ring counter
9. Implement the minimized circuit of Modulo-6 counter
10. To design, implement and test a 16 :4 multiplexer using logic gates.
11. To design, implement and test a 4:16 demultiplexer using logic gates.
12. Design & test Johnson Counter.

BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
VII SEMESTER

Ref No.	Subject	SCHEDULE OF TEACHING				SCHEME OF EXAMINATION						
						THEORY				PRACTICAL		
		L	T	P	Total	Paper	Hrs.	Sess.	Total	Sess.	Viva-voce	Total
EE-711	Non Conventional Energy Sources	3	1	-	4	100	3	50	150	-	-	-
EC-711	Elective I	3	1	-	4	100	3	50	150	-	-	-
EC-761	Elective I Lab	-	-	2	2	-	-	-	-	50	25	75
EC-712	Communication Engg.	3	1	-	4	100	3	50	150	-	-	-
EC-762	Communication Engg. Lab	-	-	3	3	-	-	-	-	50	25	75
EC-713	Digital Signal Processing	3	1	-	4	100	3	50	150	-	-	-
EC-763	Digital Signal Processing Lab	-	-	3	3	-	-	-	-	50	25	75
EE-764	Minor Project	-	-	6	6	-	-	-	-	100	50	150
EE-765	Major Project Preliminary	-	-	2	2	-	-	-	-	75	-	75
EE-766	Seminar	-	-	3	3	-	-	-	-	100	-	100
EE-767	Vocational Training of Sixth Semester	-	-	-	-	-	-	-	-	100	-	100
Total		12	4	19	35	400	-	200	600	525	125	650

Elective I (Theory & Practical) - One of the following subjects:

(a) Wireless Communications
(b) Optical Communications

EE-711
NON – CONVENTIONAL ENERGY SOURCES

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

INTRODUCTION: Limitation of conventional energy sources, need and growth of alternative energy source, basic scheme and application of direct energy conservation.

MHD GENERATORS: Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of MHD generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.

THERMO-ELECTRIC GENERATORS: Thermoelectric effects, Seeback effect, Peltier effect, Thomson effect, thermoelectric converters, figures of merit, properties of thermoelectric material, brief description of the construction of thermoelectric generators, application and economic aspect.

PHOTO VOLTAIC EFFECT AND SOLAR ENERGY: Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency, solar batteries, application, solar radiation analysis, solar energy in India, solar collectors, solar furnaces and applications.

Part-B

FUEL CELLS: Principle of action, Gibb's free energy, general description of fuel cells, types, construction, operational characteristics and application.

MISCELLANEOUS SOURCES: Geothermal system, characteristic of geothermal resources, choice of generator set, electric equipment precautions low hydro-plants, definition of low head hydrometer, choice of site, choice of turbine wind power, history of wind power, wind machines, theory of wind power, characteristic of suitable wind power site, tidal energy, idea of tidal energy, tidal electric generator.

Recommended Books:

Non convential Energy Sources	G. D. Rai, Khanna Publishers.
Power System Engineering	A Chakrabarti, M. L. Soni, P. V. Gupta and U. S. Bhatnagar, Dhanpat Rai & Co.
Generation of Electrical Energy	B. R. Gupta, S. Chand.

EC 711 (a)
Wireless Communication

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Course duration: 45 lecturers of one hour duration each.

Part-A

Introduction

Evolution of Mobile Communication Systems, Paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems, 2G cellular networks, 2.5 G wireless network, HSCSD, GPRS, EDGE technology, 3G wireless network, UMTS, 3G CDMA2000, 3G TD-SCDMA, Wireless Local Loop, Blue tooth and Personal Area Networks (12)

Cellular System Design Fundamentals

Frequency reuse, Channel alignment strategies, handoff strategies, interference and system capacity,Near for problems, power control, improving coverage and capacity in cellular systems, parameters for mobile multipath channel, Small scale fading. (09)

Modulation Techniques

Amplitude Modulation, Angle modulation, Digital Modulation, Spread Spectrum Modulation techniques (04)

Part-B

Diversity Techniques for Mobile Radio Systems

Dispersive channels, space diversity, frequency diversity, Polarization diversity, Hybrid and quadruple diversity, RAKE receiver, Equalizer techniques. Fundamentals of channels coding. (05)

Overview of Multiple Access Techniques

Simplex, Duplex TDD and Time Division Duplex, Time Division Multiple Access(TDMA), FDMA and OFDM, CDMA, Hybrid multiple access, Management of voice, Data and Video(Multimedia) information (05)

Wireless Networking

Difference between wireless and fixed telephone networks, ISDN, Development of wireless networks. (04)

Wireless Systems

GSM,GSM Architecture, CDMA Digital cellular standard, IS-95 system. (06)

Books Recommended:

1. Wireless Communications Principles and practice by Theodore S. Rappaport, Prentice Hall India, Edition 2nd
2. Modern Wireless Communications by Simon Haykin , Michael Moher , PHI,Edition Latest
3. Wireless Communication and Networking By Jon W Mark, PHI, Edition Latest
4. Mobile Radio Communication by Steele R., Hanzo L., Wiley, 2nd Edition.

EC-761(a)
Wireless Communication Lab.

L T P
0 0 2

External: 25
Sessional: 50

Practicals related to Theory.

EC-711(b)
Optical Communications

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Course duration: 45 lecturers of one hour duration each

Part-A

Overview Of Optical Fibre Communication:
Elements of basic communication system, communication system architecture and advantages of optical communication. (02)

Optical fibre wave guides, transmission characteristics and fabrication techniques:
Ray Theory of Transmission, Electromagnetic mode theory for optical communication of both types of fibers viz step index fiber and graded index fibers Attenuation, Material absorption losses, linear and non linear scattering losses, fiber bend loss, dispersion viz intermodal dispersion and intramodal dispersion, overall fiber dispersion and polarization
Preparation of optical fiber: liquid-phase techniques, vapor phase deposition techniques. (12)

Couplers And Connectors:
Connector Principles, Fiber End Preparation, splices, connectors (03)

Optical Fiber Sensors:
Intensity modulated sensor - general features, intensity modulation through light interruption, shutter multimode fiber sensors and reflective fiber optic sensors. (06)

Part-B

Optical Sources And Detectors:
Sources: Basic principle of surface emitter LED and edge emitter LED- material used, structure, internal quantum efficiency and characteristics, LASER Diode - material used, structure, internal quantum efficiency and characteristics, working Principle and haracteristics of Distributed feedback (DFB) laser. Detectors: PIN photodiode - material used, working principle & characteristics, Avalanche Photodiode: - material used, working principle and characteristics. (14)

Optical Fiber Measurements:
Total Fiber attenuation measurement using cut back technique, dispersion measurement in frequency and time domain, fiber refractive index profile measurement using interferometric methods, Numerical Aperture measurement and fiber diameter measurement. (08)

Books Recommended:

1. Optical Fiber Communication Principles & Practice by John M.Senior,PHI, Edition Latest
2. Optical Communication Systems by John Gowar, PHI, Edition Latest .
3. Optical Fiber Communication by Gerd Keiser, Mc Graw Hill International Publications, Edition 3rd
4. Fundamentals of Fibre Optics in Telecommunication and sensor systmes by Bishnu P.Pal, New Age International (P) Ltd, Edition Latest

EC -761(b)
Optical Communications Lab

L T P
0 0 2

External: 25
Sessional: 50

List of Experiments:

1. To determine the Numerical aperture of a given fibre & losses in optical fibre.
2. To determine the V.parameter,the core radius & core cladding dielectric constant difference of a step index single mode fibre.
3. To measure the cut of the wavelength of a single fibre.
4. To study fibre optical analog link
5. To study fibre optical digital link
6. To study the effect of EMI/RFI on a fibre medium.
7. To setup the multiplexer & observe the simultaneous transmission of several channels on fibre optical links.
8. To study Manchester coding/decoding of fibre optical link.
9. To study LASER communication system
10. Use the connecterisation/kit/splicing kit
11. To study the following instruments
    (a) Fibre optical power meter
    (b) Fibre optical power source
12. To study optical fibre system using laser
13. To study bending losses in OFC.

EC-712
Communication Engineering

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.
Course Duration: 45 Lectures of one hour each.

Part-A

Amplitude Modulation & Demodulation and Systems

Concept of Modulation its merits & demerits, Principle and generation of AM, DSB/SC, SSB signal collector and base Modulated class C amplifier, Balanced modulator, AM transmitter, Radio noise in AM systems, Detection of AM, DSB/SC, and SSB signals, Super heterodyne and communication Radio Receivers, SSB receiver, Diversity reception.

(15)

Frequency Modulation

Principles and generation of FM and PM signals, Reactance Modulator met6hod, Armstrong Method, noise consideration in FM and PM system. (07)

Part-B

Frequency Demodulation and Systems

detection of FM and PM signals, Foster Discriminator, ratio and PLL detectors, FM Transmitter(Block Diagram), FM receiver (Block Diagram), Pre-emphasis and de-emphasis circuit. (08)

(15)

Pulse Modulation & Demodulation

Principles, generation and detection of PAM, PWM, PPM & PCM signals, noise in pulse modulation system, band width consideration, companding, delta modulation ,adaptive delta modulation systems. TDM & FDM

(15)

Books Recommended:

1. Electronic Principles by Dennis Raddy & John Coolin,Pub:PHI, Edition Latest

2. Electronic Communication Systems by G. Kennedy ,Pub: Mc Graw Hill, Edition 4th

3. Principles of Communication Systems by Taub and Schilling, Edition 2nd

EC-762
Communication Engineering Lab

L T P
0 0 3

External: 25
Sessional: 50

List of experiments:-

1. To measure the modulation index of AM signals using the trapezoidal method
2. To study DSB/ SC AM signal and its demodulation using product Detector Circuit.
3. To study the voltages and waveforms of various stages of super-heterodyne receiver
4. To measure the sensitivity and selectivity of a super heterodyne radio receiver
5. To study the voltages and waveforms of various stages of FM Receiver
6. To study the pulse code modulation and de-modulation circuit
7. To study the Time division multiplexing and demultiplexing circuit
8. To study delta modulation and demodulation circuits.
9. To study sigma delta modulation and demodulation circuits.

EC-713
Digital Signal Processing

L T P
3 1 0

External: 100
Sessional: 50

Course duration: 45 lecturers of one hour duration each
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART A

CONTINUOUS TIME SIGNALS **(04)**
Review of Fourier series and Fourier Transform, Sampling of Continuous Time signals.

DISCRETE TIME SIGNALS **(08)**
Discrete time Signals & Systems, Linear Time Invariant systems, Stability and Causality, Solution of Linear constant coefficient difference equations, Convolution, Correlation, Z-Transform and its properties, Inverse Z transform.

FREQUENCY DOMAIN REPRESENTATION OF SIGNALS & SYSTEMS **(10)**
Fourier series & Fourier Transform of Discrete time signals, Discrete Fourier Transform and its properties, Fast Fourier Transform, Decimation in time and Decimation in frequency algorithms. Frequency domain representation of discrete time systems, systems function.

PART B

DIGITAL FILTERS **(10)**
Ideal Filter vs. Practical Filters, General Specifications and Design Steps, Comparison of FIR & IIR Filters.
Design of FIR Filters: Window technique, Frequency sampling technique.
Design of IIR Filters: Impulse Invariance technique, Bilinear Transformation, Design of IIR Filters using Butterworth, Chebyshev and Elliptic filter, Digital frequency transformation.

IMPLEMENTATION OF DISCRETE TIME SYSTEMS **(05)**
Block diagrams and signal flow graphs for FIR and IIR systems. Direct form, Cascade and Frequency Sampling Structures for FIR systems, Direct forms, Cascade and Parallel form realization of IIR systems, Finite Word Length Effects.

DSP PROCESSORS **(08)**
Introduction to fixed point and floating point processors and their architecture, TMS320C5X Architecture, Memory, Addressing Modes, Interrupts and Assembly Language Programming

Recommended Books:

1. "Digital Signal Processing: Principles, Algorithms and Applications" Fourth Edition by Proakis & Manolakis, Pearson Education Ltd.
2. "Digital Signal Processing" by E C Ifeacher and B W Jervis
3. "Digital Signal Processing: A Modern Introduction" by Ashok Ambardar. Thomson

4. "Digital Signal Processing" by A.V Oppenheim and R.W.Schafer, Pearson Education Ltd.
5. "Digital Signal Processing" by Sanjit and Mitra. Tata Mcgraw Hill.
6. "Digital Signal Processing" by S Salivahanan, A Vallavraj, C Gnanapriya. Tata Mcgraw Hill.

EC-763
Digital Signal Processing Lab

L T P
0 0 3

External: 25
Sessional: 50

List of Experiments:

1. Generating & Plotting Discrete time signals using MATLAB.
2. Use of basic multi-signal processing signals of MATLAB
3. To perform different operations -addition, multiplication, scaling, folding, and shifting using MATLAB.
4. Convolution of Causal & Non Causal sequences in MATLAB.
5. Auto & Cross-Correlation in MATLAB.
6. Study the effect of noise on signals in MATLAB Detection of Signals buried in Noise.
7. DFT & IDFT of two sequences.
8. FFT of two Sequences.
9. FIR Filter Design using Window Method in MATLAB.
10. IIR Filter Design using Bilinear Transformation in MATLAB.
11. IIR Filter Design using Impulse Invariance in MATLAB .
12. Butterworth and Chebyshev Digital IIR Filters in MATLAB .
13. Implementation of Filter Structures in MATLAB.
14. Study of DSP kits.
15. System Design based on DSP kits.

BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)
VIII SEMESTER

Ref No.	Subject	SCHEDULE OF TEACHING				SCHEME OF EXAMINATION						
						THEORY				PRACTICAL		
		L	T	P	Total	Paper	Hrs.	Sess.	Total	Sess.	Viva-voce	Total
EE-801	Electric Power Generation	3	1	-	4	100	3	50	150	-	-	-
EE-811	Elective –II	3	1	-	4	100	3	50	150	-	-	-
EE-861	Elective –II Lab	-	-	3	3	-	-	-	-	50	25	75
EC-811	Neural Networks and Fuzzy Logic	3	1	-	4	100	3	50	150	-	-	-
EC-861	Neural Networks and Fuzzy Logic Lab	-	-	3	3	-	-	-	-	50	25	75
EC-812	Embedded Systems	3	1	-	4	100	3	50	150	-	-	-
EC-862	Embedded Systems Lab	-	-	3	3	-	-	-	-	50	25	75
EE-863	Major Project	-	-	9	9	-	-	-	-	200	100	300
EE-864	General Fitness	-	-	-	-	-	-	-	-	125	-	125
Total		12	4	18	34	400	-	200	600	475	175	650

Elective II (Theory & Practical)- one of the following subjects:

(a) Energy Management and Auditing
(b) Electrical Machines Design

EE-801
ELECTRIC POWER GENERATION

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Introduction:
Electrical energy sources, organization of power sector in India, single line diagram of thermal, hydro and nuclear power stations.

2. Loads and Load curves:
Maximum demand, Group diversity factor, Peak diversity factor, Types of load, chronological load curves, load-duration Curve, mass curves, load factor, capacity factor, utilization factor, base load and peak load plants, load forecasting.

3. Power Plant Economics:
Capital cost of plants, annual fixed cost, operating costs and effect of load factor on cost of energy, depreciation.

4. Tariffs and power factor improvement:
Objectives of tariff making, different types of tariff for domestic, commercial, agricultural and industrial loads. Need for p.f. improvement, p.f. improvement using capacitors, determination of economic p.f.

Part-B

5. Selection of plant:
Plant location, plant size, no. and size of units in plants, economic comparison of alternatives , annual cost , rate of return, present worth and capitalized cost methods.

6. Economic operation of steam plants:
Methods of loading turbo-generators, input- output curve, heat rate, incremental cost, method of lagrangian multiplier, effect of transmission losses, co ordination equations, iterative procedure to solve co-ordination equations.

7. Hydro-thermal co-ordination:
Advantages, combined working of run off river plant and steam plant, reservoir hydro plants and thermal plants-long term operational aspects, scheduling methods.

8. Pollution and environmental problems:
Energy and environment, Air pollution, Aquatic impacts, nuclear plant and hydro plant impacts.

9. Cogeneration:
Definition and scope, Topping and Bottoming Cycles, Benefits, cogeneration technologies.

Recommended Books:

1. Generation of Electric Energy B.R. Gupta, S.Chand Publishers
2. Power Plant Engineering Dom Kundwar.
3. Power Plant Engineering R. K. Rajput.
4. Power System Engineering A. Chakrabarti, M. L. Soni, P. V.Gupta, U.S. Bhatnagar.

EE 811 (a)
Energy Management and Auditing

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Energy Scenario and Basics of Energy

Energy scenario in world and India, Energy Conservation and its Importance, Energy Strategy for the Future, The Energy Conservation Act, 2001 and its Features, Various Forms of Energy, Electrical Energy Basics 3

Energy Management and Audit

Definition & Objectives of Energy Management, Energy Audit: Types and Methodology, Energy Audit Reporting Format, Understanding Energy Costs, Benchmarking and Energy Performance, Matching Energy Usage to Requirement, Maximizing System Efficiency, Fuel and Energy Substitution, Energy Audit Instruments. 6

Energy Action Planning and Financial Management

Introduction, Energy Management System, Introduction, Investment Need, Appraisal and Criteria, Financial Analysis, Financial Analysis Techniques, Sensitivity and Risk Analysis, Financing Options. Introduction and steps in Project Management 8

Energy Monitoring and Targeting

Definition, Elements of Monitoring & Targeting System, A Rationale for Monitoring, Targeting and Reporting, Data and Information Analysis, Relating Energy Consumption and Production, CUSUM, Case Study. 6

Part-B

Electrical System and Motors

Electrical Load Management and Maximum Demand Control, Power Factor Improvement and Benefits, Harmonics, Analysis of Electrical Power Systems Motor Selection, Energy Efficient Motors, Factors Affecting Energy Efficiency and Minimizing Motor Losses in Operation, Rewinding Effects on Energy Efficiency, Speed Control of AC Induction Motors, Motor Load Survey: Methodology 8

Lighting System

Introduction, Basic Terms in Lighting System and Features, Lamp Types and their Features, Recommended Illuminance Levels for Various Tasks/Activities/Locations,

Methodology of Lighting System Energy Efficiency Study, Case Examples, Some Good Practices in Lighting. 6

Energy Efficient Technologies in Electrical Systems

Maximum Demand Controllers, Automatic Power Factor Controllers, Energy Efficient Motors, Soft Starter, Variable Speed Drives, Energy Efficient Transformers, Electronic Ballasts, Energy Efficient Lighting Controls. 6

Books:

1. V.S. Verma General Aspects of Energy Management and Energy Audit, , Bureau of Energy Efficiency, II edition, 2005.
2. V.S. Verma Energy Efficiency In Electrical Utilities, , Bureau of Energy Efficiency, II edition, 2005.
3. Related journal and conference papers.
4. Website: www.energymanagerstraining.com

EE 861 (a)
Energy Management and Auditing Lab

L T P
0 0 3

External: 25
Sessional: 50

Note: Atleast four experiments and a case study are to be performed.

List of experiments:

1. To obtain polar curve of a lamp.
2. To measure harmonics and do the analysis for any 3-phase system.
3. To measure the currents, voltages and active and reactive powers in a three phase system using energy auditor.
4. To design a lighting system for any auditorium/building/ hall.
5. To test a 3-phase machine of unknown rating.

Case Study:

1. To perform case study for energy audit of educational institute/ industrial unit/ administrative or commercial building and prepare a complete report suggesting the changes to be made.

EE 811(b)
Electrical Machine Design

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. **Principles of design of Machines:** Specific magnetic and electric loadings output, Real and apparent flux densities, temperature rise calculation, Separation of main dimension for DC machines, Induction machines and synchronous machines.

2. **Heating cooling and ventilation:** Cooling of machines, types of ventilation, continuous and intermittent rating.

3. **Design of Transformers:** General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling tubes, calculation of losses, efficiency and regulation, forces winding during short circuit.

Part-B

4. **Three Phase Induction Motors:** General considerations, output equation, choice of specific electric and magnetic loadings, efficiency, power factor, number of slots in stator and rotor, elimination of harmonic torques, Design of stator and rotor winding, slot leakage flux, leakage reactance, equivalent resistance of squirrel cage rotor, magnetizing current, efficiency from design data.

5. **Alternators:** Types of alternators, comparison, specific loadings, output co-efficient, design of main dimensions.

6. Introduction to Computer Aided Electrical Machine Design**.**

Books Suggested:

1. Glayton A.E. The Performance and Design of D.C. machines PITMAN (ELBS).
2. Say M.G. The Performance and Design of A.C. Machines, PITMAN (ELBS).
3. Sawhney A.K. Electrical Machine Design (Dhanpat Rai & Sons).

EE 811(b)
Electrical Machine Design Lab

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External: 25
Sessional: 50

List of Practical: Perform at least five practicals.

Design of Machines

1) Transformer Design.
2) Induction Motor Design.
3) Synchronous Machine Design.
4) DC machine Design.

Design of windings

5) DC machine Lap windings design.
6) DC machine Wave windings design.
7) AC machine winding design.

EC-811
Neural Networks and Fuzzy Logic

L T P
3 1 0

External: 100
Sessional: 50

Course Duration: 45 lectures of one hour each.
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Fundamentals of Neural Networks
Classical AI and Neural Networks, characteristics of neural networks, Historical perspective. The biological inspiration, models of artificial neuron & activation functions. Artificial neural networks & architectures. Training of artificial neural networks. (4)

Supervised Learning
Learning and memory,Representation of perceptron, Linear separability, Perceptron Learning, Training of single layer and multi-layer, back propagation training algorithm, Applications of backpropogation, Universal function approximation. (6)

attractors Neural Networks
Introduction, Associative memory, Hopfield networks, Content addressable memory, Bidirectional associative memories. (5)

Part-B

ART Networks
Vector quantization & simplified ART architecture, Architectures & algorithms of ART1 & ART2 networks, Applications. (4)

Self-organizing Feature Map
Introduction, Competitive learning, Maxican Hat networks, SOFM algorithm, Applications. (5)

Fuzzy Logic
Basic concepts of Fuzzy Logic, Fuzzy vs Crisp set, Fuzzy uncertainty & Linguistic variables, membership functions, operations on fuzzy sets, fuzzy rules for approximate reasoning, variable inference techniques, defuzzification techniques, Applications of fuzzy logic, Fuzzy system design. (5)

Books Recommended:

1. Neural Networks – A Classroom Approach by Satish Kumar, TMH.
2. Neural Networks,fuzzy Logic, and Genetic Algorithms by Rajasekaran & Vijayalakhmi Pai, PHI.
3. Neural Network Design by Hagan, Demuth & Beale, CENGAGE Learning.
4. Neural Networks – A Comprehensive Foundation by Simon Haykin, Pearson Education.
5. Fuzzy Logic with engineering applications by Ross, Mc-Graw Hill.

EC-861
Neural Networks and Fuzzy Logic Lab

L T P
0 0 3

External: 25
Sessional: 50

Practicals related to Theory.

EC- 812
Embedded Systems

L T P
3 1 0

External: 100
Sessional: 50

Course Duration: 45 lectures of one hour each.
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

Introduction Review of Embedded Hardware
Memory – Microprocessors – Buses – Direct Memory Access – Interrupts – Built ins on the Microprocessor. Conventions used on Schematic, Microprocessor Architecture – Interrupt Basic – Shared Data Problems – Interrupt Latency.
(10)

PIC Micro controller & Interfacing
Introduction, CPU Architecture, Register file structure, Instruction Set, Programs, Timers and Interrupts – Interrupt Service Routine – features of Interrupts – Interrupt vector & Priority, Timing Generation & Measurements, Compare mode, Capture mode, Event counter, PWM, Frequency Measurement – Interfacing Methods, I/O Interface, SPI, LCD interfacing, Seven segment interfacing, I^2C Bus, DAC, Serial EEPROM, ADC, UART.
(15)

PART-B

Software Development & Tools: Software architectures, Round – Robin, Round-Robin with Interrupts, Function Queue Scheduling architecture, Introduction to assembler – Compiler –n Cross compilers and Integrated Development Environment IDE, Linker/ Locators, Simulators, Getting Embedded software into target System Debugging Strategies,.
(08)

Introduction to Real Time Operating Systems: Task And Task States, Tasks and Data, Semaphores and shared data (5)

Operating System Services: Message queues, Mailboxes and Pipes, Timer Function, Events, Memory Management, Interrupt Routines in an RTOS Environment, Basic Design Using RTOS.
(7)

Book Recommended:

1. An Embedded Software Primer, by David E. Simon, Pearson Education, Latest Edition.
2. PIC Microcontroller by John B. Peatman, Pearson Education, Latest Edition.
3. D. D. Gajski, F. Vahid, S. Narayan, J. Gong, Specification and Design of Embedded Systems, Prentice Hall.
4. Steve Heath, Embedded systems design, Newnes, 1997.
5. Hardware Software Co-design of Embedded Systems, F. Balarin, Chiodo, et al., Kluwer Academic Publishers, May 1997

EC-862
Embedded Systems Lab

L T P
0 0 3

External: 25
Sessional: 50

Practicals related to Theory.