B. TECH –1ST YEAR

GROUP -A

Scheme of Examination (Common to all branches)										
1st Semester						Exam Schedule		Practical Schedule		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
AS-1001	Applied Maths-1	3	1	-	4	100	50	-	-	150
AS-1002	Applied Physics-1	3	1	-	4	100	50	-	-	150
ME-1001	Engg.Graphics Drawing	0	0	6	6	100	50	-	-	150
HU-1003	Comm. & Prof.skills in English.	3	1	0	4	100	50	-	-	150
EC-1001	Basic Electronics	3	1	-	4	100	50	-	-	150
CS-1001	Introduction to Computer & Programming in C	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
AS-1003	Applied Physics Lab	-	-	2	2	-	-	50	50	100
EC-1002	Basic Electronics Lab	-	-	2	2	-	-	50	50	100
ME-1002 IT-1001	Workshop Practice I/Information Technology Trainer Workshop 1	-	-	3	3	-	-	50	50	100
CS-1002	Computer Programming Lab	-	-	2	2	-	-	50	50	100
Total		**15**	**5**	**15**	**35**	**600**	**300**	**200**	**200**	**1300**

Note:

1. In campus 4 week vocational training for all branches will be held after the second semester and credit for the same will be given in the 3rd Semester. In place of this UIIT will go for this 4 week vocational training during winter vacation at the end if 1st Semester. However, credits for the same will be given in the 3rd semester.
2. Vocational Training consists of extended workshop training in shops of Carpentry, fitting, foundry, Welding and Electrical Workshop.
3. Course Nos. AS-1001 and AS-1002 will be common for Groups A and B in 1st Semester.

B. TECH –1ST YEAR

GROUP -B

Scheme of Examination (Common to all branches)										
1st Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
AS-1001	Applied Maths-1	3	1	-	4	100	50	-	-	150
AS-1002	Applied Physics-1	3	1	-	4	100	50	-	-	150
AS-1004/ IT-1002	Chemistry/Foundation of Information Technology	3	1	-	4	100	50	-	-	150
HU-1002	Science, Technology & Society	3	1	-	4	100	50	-	-	150
EE-1001	Basic Electrical Engineering	3	1	-	4	100	50	-	-	150
ME-1003	Basic Mechanical Engineering	4	1	-	5	100	50	-	-	150
(Practicals/Drawing/Design)										
AS-1005/ IT-1003	Applied Chemistry Lab/MATLAB Lab	-	-	2	2	-	-	50	50	100
EE-1002	Basic Electrical Engineering Lab	-	-	2	2	-	-	50	50	100
ME-1004/ IT-1004	Workshop Practice II/ Information Technology Training Workshop II	1	-	3	4	-	-	50	50	100
ME-1005	Basic Mechanical Engineering Lab	-	-	2	2	-	-	50	50	100
Total		**20**	**6**	**9**	**35**	**600**	**300**	**200**	**200**	**1300**

Note:

1. University Institute of Information Technology (UIIT) will offer Information Technology Trainer Workshop I/II (IT-101)/(IT-104) in place of Workshop I/II(ME-102) / (ME-104).

2. Course Nos. AS-1006 and AS-1007 will be common for Groups A and B in Second Semester.

B. TECH –1ST YEAR

GROUP -A

Scheme of Examination (Common to all branches)										
2nd Semester						Exam Schedule		Practical Schedule		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
AS-1006	Applied Maths-II	3	1	-	4	100	50	-	-	150
AS-1007	Applied Physics-II	3	1	-	4	100	50	-	-	150
AS-1004/ IT-1002	Chemistry/Foundation of Information Technology	3	1	-	4	100	50	-	-	150
HU-1002	Science, Technology & Society	3	1	-	4	100	50	-	-	150
EE-1001	Basic Electrical Engineering	3	1	-	4	100	50	-	-	150
ME-1003	Basic Mechanical Engineering	4	1	-	5	100	50	-	-	150
(Practicals/Drawing/Design)										
AS-1005/ IT-1003	Applied Chemistry Lab/MATLAB Lab	-	-	2	2	-	-	50	50	100
EE-1002	Basic Electrical Engineering Lab	-	-	2	2	-	-	50	50	100
ME-1004/ IT-1004	Workshop Practice II/ Information Technology Trainer Workshop II	1	-	3	4	-	-	50	50	100
ME-1005	Basic Mechanical Engineering Lab	-	-	2	2	-	-	50	50	100
Total		**20**	**6**	**9**	**35**	**600**	**300**	**200**	**200**	**1300**

Note:

1. University Institute of Information Technology (UIIT) will offer Information Technology Trainer Workshop I/II (IT-1001) / (IT-1004) in place of Workshop I/II (ME-1002)/ (ME-1004).
2. Vocational Training consists of extended workshop training in shops of Carpentry, fitting, foundry, Welding and Electrical Workshop.
3. Course Nos. AS-1001 and AS-1002 will be common for Groups A and B in 1st Semester.

B. TECH –1ST YEAR

GROUP -B

Scheme of Examination (Common to all branches)										
2nd Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
AS-1006	Applied Maths-II	3	1	-	4	100	50	-	-	150
AS-1007	Applied Physics-II	3	1	-	4	100	50	-	-	150
ME-1001	Engg.Graphics Drawing	0	0	6	6	100	50	-	-	150
AS-1001	Comm. & Prof.skills in English.	3	1	0	4	100	50	-	-	150
EC-1001	Basic Electronics	3	1	-	4	100	50	-	-	150
CS-1001	Introduction to Computers & Programming in C	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
AS-1004	Applied Physics Lab	-	-	2	2	-	-	50	50	100
EC-1002	Basic Electronics Lab	-	-	2	2	-	-	50	50	100
ME-1002 IT-1001	Workshop Practice I/Information Technology Trainer Workshop 1	-	-	3	3	-	-	50	50	100
CS-1002	Computer Programming Lab	-	-	2	2	-	-	50	50	100
Total		**15**	**5**	**15**	**35**	**600**	**300**	**200**	**200**	**1300**

Note:

1. In campus 4 week vocational training for all branches will be held after the second semester and credit for the same will be given in the 3rd Semester. In place of this UIIT will go for this 4 week vocational training during winter vacation at the end if 1st Semester. However, credits for the same will be given in the 3rd semester.
2. Course Nos. AS-1006 and AS-1007 will be common for Groups A and B in 2nd Semester.

B.Tech (Electrical and Electronics Engineering) EEE										
3rd Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
AS(ID)3001	Numerical Analysis and Computer Programming	3	1	-	4	100	50	-	-	150
EC(ID)3001	Digital Electronic	3	1	-	4	100	50	-	-	150
EC-3003	Analog Electronic Circuits.	3	1	-	4	100	50	-	-	150
EE(ID) 3001	Circuit Theory	3	1	-	4	100	50	-	-	150
EE-3002	Electrical Engg. Materials & Application.	3	1	-	4	100	50	-	-	150
EE-3003	Electrical Machines-1	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
AS(ID) 3003	Numerical Analysis and Computer Programming Lab	-	-	2	2	-	-	50	50	100
EC(ID) 3004	Digital Electronics Lab.	-	-	2	2	-	-	50	50	100
EC-3005	Analog Electronic Circuits Lab	-	-	2	2	-	-	50	50	100
EE - 3004	Electrical Machines Lab-1	-	-	3	3	-	-	50	50	100
ME(ID) 3001	Vocational Training.	-	-	-	-	-	-	50	50	100
Total		**18**	**6**	**9**	**33**	**600**	**300**	**250**	**250**	**1400**

B.Tech (Electrical and Electronics Engineering) EEE										
4th Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
EE-4001	Transmission & Distribution of Electrical Power	3	1	-	4	100	50	-	-	150
EE-4002	Electric Machine-II	3	1	-	4	100	50	-	-	150
EE-4004	Power electronics	3	1	-	4	100	50	-	-	150
EE-4006	Communication Engineering	3	1	-	4	100	50	-	-	150
EC-4005	Pulse Shaping & Wave Generation	3	1	-	4	100	50	-	-	150
EEE-4001	Electrical and Electronics Measurement	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
EE-4007	Electrical Machine-II Lab	-	-	2	2	-	-	50	50	100
EE-4008	Power electronics Lab.	-	-	2	2	-	-	50	50	100
EE-4010	Transmission & Distribution of Electrical Power Lab	-	-	2	2	-	-	50	50	100
EEE-4002	Electrical and Electronic Measurement Lab	-	-	2	2	-	-	50	50	100
Total		**18**	**6**	**8**	**32**	**600**	**300**	**200**	**200**	**1300**

- **4 weeks Industrial Training during the summer vacation after 4th semester and credit to be given in the 5th semester.**

B.Tech (Electrical and Electronics Engineering) EEE										
5th Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
EC-5002	Electromagnetic Field Theory	3	1	-	4	100	50	-	-	150
EC-5011	Microprocessor	3	1	-	4	100	50	-	-	150
EE-5001	Electrical Power Generation.	3	1	-	4	100	50	-	-	150
EE-5003	Electrical Drives & Fact Devices.	3	1	-	4	100	50	-	-	150
EEE-5001	Non Conventional Energy Resources.	3	1	-	4	100	50	-	-	150
EC-5003	Micro Electronics & LIC	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
EC(ID) 5006	Microprocessor Lab	-	-	3	3	-	-	50	50	100
EC-5009	Electronics Design Lab.	-	-	3	3	-	-	50	50	100
EE-5007	Industrial Training	-	-	-	-	-	-	50	50	100
Total		**18**	**6**	**6**	**30**	**600**	**300**	**150**	**150**	**1200**

B.Tech (Electrical and Electronics Engineering) EEE										
6th Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
EC-6012	Advance Microprocessor & Controller (MICRO & PLC)	3	1	-	4	100	50	-	-	150
EE-6001	Switch Gear & Protection.	3	1	-	4	100	50	-	-	150
EE-6002	Energy Management	3	1	-	4	100	50	-	-	150
EE-6004	Electrical Energy Utilization	3	1	-	4	100	50	-	-	150
EC-6004	Linear Control Systems.	3	1	-	4	100	50	-	-	150
EEE-6001	Electronics Logic Circuit Design.	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
EC-6013	Advance Microprocessor & Controller (MICRO & PLC) Lab	-	-	2	2	-	-	50	50	100
EE-6006	Switch Gear & Protection Lab	-	-	2	2	-	-	50	50	100
EC-6008	Control Systems Lab	-	-	2	2	-	-	50	50	100
EEE-6002	Electronic Circuit Simulation Lab.	-	-	2	2	-	-	50	50	100
Total		**18**	**6**	**8**	**32**	**600**	**300**	**200**	**200**	**1300**

B.Tech (Electrical and Electronics Engineering) EEE

7th Semester						Exam Schedule		Practical Schedule		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
EC-7001	TV Engineering.	3	1	-	4	100	50	-	-	150
EC-7006	Biomedical Electronics.	3	1	-	4	100	50	-	-	150
EE-7002	Power System Operation & Control.	3	1	-	4	100	50	-	-	150
EE-7003	Entrepreneur Development	3	1	-	4	100	50	-	-	150
EC(ID)7005	Digital System Design.	3	1	-	4	100	50	-	-	150
EEE-7004	High Voltage Engineering & DC.	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
EC-7007	TV Engineering Lab	-	-	2	2	-	-	50	50	100
EC-7010	Digital System Design Lab	-	-	2	2	-	-	50	50	100
EE-7007	Entrepreneur Development	-	-	2	2	-	-	-	50	50
EE-7010	Industrial Training	-	-	-	-	-	-	50	50	100
EE-7011	*Project/ Industrial Project.	-	-	4	4	-	-	50	50	100
Total		**18**	**6**	**10**	**34**	**600**	**300**	**200**	**250**	**1350**

*** Project/Industrial Project shall be started in the 7th Semester and will continue in the 8th Semester.**

B.Tech (Electrical and Electronics Engineering) EEE										
8th Semester						**Exam Schedule**		**Practical Schedule**		
Course No.	**Subjects**	L	T	P	Total	Theory	Sess	Pract	Sess	Total
EC(ID) 8001	Digital Signal Processing.	3	1	-	4	100	50	-	-	150
CS-8001	System Software	3	1	-	4	100	50	-	-	150
EE-8002	Computer Applications to Power System Analysis.	3	1	-	4	100	50	-	-	150
EEE-8001	Power Plant Engineering.	3	1	-	4	100	50	-	-	150
XXX-XXXX	Elective- I	3	1	-	4	100	50	-	-	150
XXX-XXXX	Elective- II	3	1	-	4	100	50	-	-	150
(Practicals/Drawing/Design)										
EC(ID)8006	Digital Signal Processing Lab.	-	-	3	3	-	-	50	50	100
EE-8005	Computer Applications to Power System Analysis Lab.	-	-	2	2	-	-	50	50	100
EE-8006	Project / Industrial Project.	-	-	8	8	-	-	100	100	200
EC-8008	General Proficiency	-	-	-	-	-	-	100	-	100
Total		**18**	**6**	**13**	**37**	**600**	**300`**	**300**	**200**	**1400**

SEMESTER – III

NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING AS (ID) 3001

Course Code	**AS(ID)3001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**NUMERICAL ANALYSIS & COMPUTER PROGRAMMING**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTRODUCTION TO COMPUTER PROGRAMMING: Review of computer programming in C and C++ languages. Arithmetic expressions, simple programs. The emphasis should be more on programming techniques rather than the language itself.

FINITE DIFFERENCES & INTERPOLATION: Various difference operators and relation between them. Newton's forward and backward interpolation formulae. Central difference interpolation formula. Gauss's forward and backward interpolation formulae. Lagrange's interpolation formula and Newton's divided difference formulae.

SECTION-B

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Bisection method, method of false position, secant method, Lteration method, Newton-Raphson method, Generalized Newton- Raphson method.

SOLUTION OF SIMULTANEOUS ALGEBRAIC EQUATIONS: Jacobi's method, Gauss-seidal method, relaxation method.

SECTION –C

NUMERICAL DIFFERNTIATION AND INTEGRATION: Formulae for derivatives. Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Boole's and Weddle's rules, Romberg's integration.

SECTION – D

NUMERICAL SOLUTION OF P.D.E.: Finite difference approximations of partial derivatives, solution of Laplace equation (Standard 5-point formula only) One-dimensional heat equation (Schmidt method, Crank – Nicolson DuFort method and Frankel method) and wave equation.

TEXT BOOKS

1. Numerical Methods in Engg. & Sciences: B.S. Grewal: Khanna Publishers.
2. Numerical methods for Scientific & Engg. Computations: M.K.Jain, S.R.K Iyengar & R.K.Jain; Wiley Eastern Ltd.

REFERENCE BOOKS

1. Computer Oriented Numerical methods: U.Rajaramanm Orebtuce; Hall of India.
2. Introduction to Numerical Analysis: C.E.Froberg; Addison Wesley.

NOTE: Students will be asked to write computer program of problems discussed in C/C++

SEMESTER – III

DIGITAL ELECTRONICS **EC (ID)-3001**

Course Code	**EC(ID)-3001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**DIGITAL ELECTRONICS**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (Based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

Binary, octal & Hexadecimal number systems and their inter conversion. Binary arithmetic (Addition & Subtraction, Multiplication & Division), 1's & 2's complements, 9's & 10's complement, BCD code, BCD Addition, Gray Code, Error Detection and Correction, Hamming code.

SECTION-B

Logic functions (OR, AND, NOT, NAND, NOR, XOR), Elements of Boolean Algebra (Theorems truth tables and relation's) Negative & Positive logic, Saturated & non saturated logic, fan in, fan-out, Logic IC's de Morgan's Theorem, minterms and maxterms.

Karnaugh mapping, K-map representation of logical function for 2,4 variable, simplification of Boolean equations with the help of K-map, Various minimization techniques, Quine's method and Quinnes Mc-Cluskey method, Half adder, full adder, half subtractor, full subtractor, serial and parallel binary adder.

SECTION-C

Introduction and performance criteria for logic families, various logic families – DCTL,RTL,DTL, TTL & EC working and their characteristics in brief, MOS Gates and GMOS Gates, comparison of various logic families.

SECTION-D

Various kinds of Flip-Flop: RS Flip-Flop, Clocked RS Flip-Flop, Edge triggered D Flip-Flop, Flip-Flop Switching time, JK Flip-flop, JK Master Slave Flip flop, lock waveforms.

555 timer as an astable multivibrator, shift registers: serial in serial out, parallel in parallel out, Ring counters, asynchronous counters, synchronous counters.

D/A Converter, A/D Converter, clipping and clamping circuits, astable, monostable, bistable multivibrators using transistor.

BOOKS

1. Malvino and Leach, Digital Principles and Applications.
2. Taub and Schilling, Digital Integrated Electronics.
3. Samuel C Lee, Digital Circuits and Logic Design 4.
4. Pulse, Digital and Switching Waveforms – Millman and Taub.
5. R.P.Jain – Modern Digital Electronics.
6. Floydd – Digital Fundamentals.
7. Malvino- Digital Electronics Principles.

SEMESTER – III

ANALOG ELECTRONICS & CIRCUITS **EC-3003**

Course Code	**EC-3003**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ANALOG ELECTRONICS & CIRCUITS**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

MULTISTAGE AMPLIFIERS

General cascaded systems, RC Coupled amplifiers, Transformers coupled amplifiers, direct-coupled amplifiers, cascaded amplifiers, Darlington compound configuration, Multistage frequency effects.

SECTION- B

HIGH FREQUENCY RESPONSE OF TRANSISTOR AMP.

High Freq. Model for CE amplifiers, approximate CE high freq. Model with resistive load, CE short circuit gain. HF Current gain with resistive load.

LARGE SIGNAL AMPLIFIER

Analysis and design of Class A, B, AB amplifiers, Push pull amplifiers, Push Pull amplifiers, transformer less output stages, distortion calculations, high power amplifiers.

SECTION-C

TUNED AMPLIFIERS

General behaviour of tuned amplifiers, Resonance, Series and parallel resonant circuit, calculations of circuit impedance at resonance. Variation of impedance with frequency, Q -Factor of a circuit and coil. Bandwidth of a series and parallel resonant circuit advantage and disadvantage of tuned amplifiers, single tuned amplifiers, voltage gain and frequency response of single tuned amplifiers, double tuned amplifiers, Analysis and design of Class C amplifiers.

WIDE BAND AMPLIFIERS

High freq. and low freq. Compensation, pulse rise-time and fall-time response, wideband amplifier using bipolar and FET devices.

SECTION –D

FEEDBACK AMPLIFIERS

Feedback concept, characteristics of negative and positive feedback, Effect on I/P & O/P impedances, gain freq. response and noise.

REGULATED POWER SUPPLIES

Unregulated power supplies, Zener diode voltage regulators and transistor series and shunt regulators. OPAMP voltage regulators, IC voltage regulators. Introduction to SMPS.

BOOKS

1. Electronic Devices and Circuit Theory: Boylstad & Naschelsky.
2. Electronic circuits: Schilling and Belove.
3. Electronic Devices & Circuits: Millman & Halkias.

SEMESTER – III

CIRCUIT THEORY **EE(ID)3001**

Course Code	**EE(ID)3001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**CIRCUIT THEORY**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION – A

Laplace Transformation: Laplace transformation and its applications to circuit theory in obtaining steady state and transient response of linear circuit.

Fourier Analysis: of complex waveform, solution of linear circuit impressed with complex waveform, power and power factor associated with complex wave.

SECTION – B

Two Port network: Network elements, classification of networks, symmetrical two port networks, Equivalent T and π representation in parameter form, ladder and lattice networks, Parameter representation: Z parameters (open ckt impedance parameters), Y parameters (short ckt admittance parameters), Hybrid parameters (h-parameter representation), ABCD parameter representation, condition of reciprocity & symmetry in two port networks, different types of interconnection of two port network including series, parallel and cascade connection, iterative and image impedances.

SECTION –C

Analysis of network using Graph Theory: Graph for given network, classification of graph and sub graphs, incidence, tie set and cut set matrices, terminology used in Network Graph, properties of tree in a graph, variable solution of network using graph theory and matrix from the concept of network function.

Coupling Circuit: Dot convention, coefficient of coupling, mutual inductances, loop and nodal equation for coupling circuits.

SECTION – D

Network Synthesis: Driving point functions, P.R functions, properties of P.R functions, Jurwitz polynomials, properties of Hurwitz polynomial functions, synthesis of reactive network by Foster & Cauer's method: Form-1 & Form –II for LC networks, Synthesis of RC network by Foster & Cauer Form.

BOOKS

1. Circuit Theory by Chakravorty.
2. Network and Circuit: Synthesis and Analysis by A.Sudhakar, Tata McGraw Hill.
3. Network Analysis by M.E Valkenburg.
4. Network Analysis by Sundaram Seeshu & N Balbanian John.
5. Network Analysis and Synthesis by D Roy Choudhary.
6. Network Analysis and Synthesis by Soni Gupta.
7. Network Analysis by Schaum Series.

SEMESTER – III

ELECTRICAL ENGG. MATERIALS & APPLICATIONS EE-3002

Course Code	**EE-3002**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**ELECTRICAL ENGG. MATERIALS & APPLICATIONS**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**			

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION – A

CONDUCTING MATERIALS: Introduction, atomic theory, Inter atomic Bonds, Resistivity and Factors Affecting Resistivity, classification of conducting materials into low-resistivity and high-resistivity materials. Main features and their applications. (Copper, aluminium, steel, brass, bronze, Tungsten, carbon, platinum, mercury). Superconductivity, super-conducting materials and their applications.

SECTION – B

INSULATING MATERIALS: Introduction, General properties of insulating materials, Electrical properties, Visual properties, Mechanical properties, Thermal properties, Chemical properties, Classification- introduction, theory of development of insulating materials, Classification of insulating materials on the basis of physical and chemical structure and their applications, Fibrous materials (Wood, Paper and card board, insulating textiles) impregnated Fibrous materials (impregnated insulating paper, varnished or impregnated textiles), non-resinous materials (bitumens, waxes).

Insulating liquids: main features and their applications. (Mineral insulating oils)
Ceramics: main features and their applications. (Porcelain, alumina, titanates, steatite) mica, asbestos, glass, natural and synthetic rubbers, insulating resins, laminates and adhesives.
Insulating gases: main features and their applications: nitrogen, hydrogen, sulphur-hexafloride.

SECTION – C

MAGNETIC MATERIALS: Permeability & Magnetic susceptibility, magnetic moment, Megnetization. Types of magnetic materials (diamagnetism, Paramagnetism, ferromagnetism), Magnetisation curve, eddy current & Hysteresis losses, curie point, Magnetostriction, applications, soft and hard materials: (pure iron, iron-silicon alloys, grain oriented sheet steel, magnetic anisotropy, annealing, nickel iron alloys, soft ferrites, carbon steel, tungsten steel, cobalt steel, alnico, hard ferrites).

SECTION – D

SEMICONDUCTORS: Introduction, electron energy and energy band theory, excitation of atoms, N-type materials, P-type materials, (Boron, Carbon, silicon, Germanium, Phophorus, Arsenic, Antimony, Sulphur, Selenium, Tellurium, Iodine). Si and Ge as semi-conducting materials, application of semiconductor materials: Rectifiers (Germanium and Silicon rectifiers, Copper – oxide And Selenium Rectifiers). Temperature-sensitive resistors or thermistors, Photoconductive cells, Photovoltaic cell, Transistor, Hall Effect Generators, Strain Gauges.

BOOKS

1. Electrical Engg. Materials: K.B. Raina, S.K.Bhattacharya, Tilak Joneja, TTTI Chandigarh: Katson Pub. House New Delhi.
2. Electrical Engg. Materials: Seth.
3. Electrical Engineering Materials: A.J.Dekker; PHI.

SEMESTER – III

ELECTRICAL MACHINES-1 **EE-3003**

Course Code	**EE-3003**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTRICAL MACHINES-1**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

Principle of Transformer operation, EMF equation, voltage ratio and turns ratio, construction of single phase Transformers, Ideal transformer, transformer on no load, phasor diagram and equivalent circuit, practical transformer, phasor diagram and equivalent circuit, voltage regulation, losser, separation of Hysteresis and Eddy current losses, open ckt, short ckt, back to back tests, Transformer efficiency, condition for maximum efficiency, per unit transformer values, all day efficiency, distribution transformers, power transformers, application of transformers.

SECTION-B

Single phase auto transformer, volt ampere relation, step up auto transformer, auto transformer efficiency, saving in conductor material, conversion of a two winding transformer to an auto transformer, advantages & disadvantages of auto transformer, applications of auto transformer.

Three phase transformer, advantages of three phase unit transformer, advantages of a transformer bank of three phase transformers, three phase transformer construction, three phase transformer groups, three phase transformer connections, factors affecting the choice of connections, delta-delta connection, star-star connection, star-delta connection, delta-star connection, open delta connection, Scott three phase/two phase connection, relationship between input and output currents, Advantages, disadvantages and applications (star-star, delta-delta, star-delta, delta-star, open-delta, Scott connection) of these type of connections. Three phase to six phase transformation, diametrical connection, 3 -phase to 12 –phase transformation, 3 winding transformers: equivalent circuit, determination of parameters, voltage regulation. Polarity of the transformers, parallel operation, single-phase transformers and 3-phase transformers in parallel Wave shape of no load (exciting) current, inrush of magnetizing current, harmonic phenomenon in 3-phase transformer. Construction of current transformers and voltage transformers, transformer cooling.

SECTION – C

Basic structure of electric machine, dc generator construction, equivalent circuit of dc machine armature, type of dc machine, emf equation of dc machine, lap & wave winding, Armature reaction in DC Generators, commutation, methods of improving commutation, demagnetizing and cross magnetizing ampere turns, characteristics of DC generator.

SECTION –D

Direct current motors: motor principle, back emf, equivalent circuit of a dc motor armature, torque of dc machine, types of dc motor, armature reaction in dc motor and interpoles, characteristics of shunt, series & compound motors, speed control of dc motors, starting of dc motors & starters, losses in dc machine, Efficiency of a dc machine, testing of a dc machines, application of dc machines.

BOOKS

1. Electrical Machines, Ashfaq Hussain, Dhanpat Rai, Delhi.
2 Electric Machines: I.J.Nagrath and D.P. Kothari, TMH, New Delhi.
3. Performance & Design of D.C.Machines: A.E.Clayton & N.N. Hancock; ELBS.
4. Electric Machinery, Fitzgerald & Kingsley, MGH.
5. Theory of alternating current machinery, A.S.Langsdorf, TMH.
6. Electrical Machinery, P.S.Bhimbra, Khanna Publishers, Delhi.
7. Generalized theory of electrical machine, P.S. Bhimbra, Khanna Publishers, Delhi.

SEMESTER – III

NUMERICAL ANALYSIS & COMPUTER PROGRAMMING LAB AS (ID) 3003

Course Code	**AS(ID)3003**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**NUMERICAL ANALYSIS & COMPUTER PROGRAMMING LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks:50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester.

WRITE DOWN AND EXECUTE FOLLOWING PROGRAMS USING C/C++ LANGUAGE

1. To find the roots of non-linear equation using Bisection method/Muller's method.
2. To find the roots of non-linear equation using Newton's method/Miller's method.
3. Curve fitting by least-squares approximations.
4. To solve the system of linear equations using Gauss-Elimination method.
5. To solve the system of linear equations using Gauss-Seidal iteration method.
6. To solve the system of linear equations using Gauss-Jordan method.
7. To solve integral equation numerically using Trapezoidal rule.
8. To solve integral equation numerically using Simpson's rule.
9. Find the largest Eigen value of a matrix by power –method.
10. To find numerical solution of ordinary differential equations by Euler's method.
11. To find numerical solution of ordinary differential equations by Runga-Kutta method.
12. To find numerical solution of partial differential equation/laplace equation/wave equation/heat equation.
13. To find numerical solution of ordinary differential equations by Milne's method.
14. To solve a given problem using Newton's forward interpolation formula.
15. To solve a given problem using Lagrange's forward interpolation formula.

NOTE: Minimum 10 experiments are to be performed.

SEMESTER – III

DIGITAL ELECTRONICS LAB **EC(ID) 3004**

Course Code	**EC(ID) 3004**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**DIGITAL ELECTRONICS LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. Verify truth tables of AND, OR, NOT, NAND, NOR and XOR gates.
2. Implement (i) half adder (ii) full adder using AND - OR gates.
3. Implement full adder using NAND gates as two level realizations.
4. Implement full subtractor using 8 to 1 multiplexer.
5. Verify truth tables of RS & JK flip flops and convert JK flip fops into D type & T type flip flops.
6. Use 555 timers as (i) monostable (ii) astable multivibrator.
7. (a) Use of 4-bit shift register for shift left and shift right operations.
   (b) Use of bit shift register as a ring counter.
8. Implement mod-10 counter and draw its output wave forms.
9. Implement 4-bit DAC using binary weighted resistance technique /R-2R ladder network technique.
10. Implement 8-bit ADC using IC (ADC 0800/0801).
11. a) Implement (i) Single level clipping circuit (ii) Two level clipping circuit.
    b) Implement clamping circuit to clamp, at peak +ve voltage/peak-ve voltage of an imput signal.

ADDITIONAL EXERCISES:

1. Construct bounce less switch.
2. Construct a pulser of 1 Hz, lkHz and manual.
3. Construct logic state detector.
4. Construct opto – sensor based.
   a) Measurement rotational speed of motor.
   b) Measurement time elapse between two events.
   c) Measurement of linear velocity.
   d) Measurement of acceleration.
5. Construct a memory using TTL Circuits. Read and write data onto a memory from bus.
6. Construct a security latch that can be operated by an identity card.

NOTE: record to be maintained both electronically and hard copy for evaluation.

SEMESTER – III

ANALOG ELECTRONICS CIRCUITS LAB **EC-3005**

Course Code	**EC-3005**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**ANALOG ELECTRONICS LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. UJT relaxation oscillator and its use as a triggering device.
2. To study amplifying action of CE transistor amplifier.
3. To determine the frequency response of a RC coupled common emitter amplifier.
4. To study frequency response of single tuned voltage amplifier.
   a) Inductively coupled.
   b) Capacitively coupled.
5. To study frequency response of Current Series Negative Feedback Amplifier.
6. To study frequency response of Voltage Shunt Negative Feedback Amplifier.
7. To study frequency response of Current Shunt Negative Feedback Amplifier.
8. To study performance of Class B Amplifier.
9. To study performance of Class C Amplifier.
10. To study the performance of Hartley & Colpitts Oscillators.
11. To study the performance of RC Phase Shift Oscillator.

SEMESTER – III

ELECTRICAL MACHINE LAB -1 **EE-3004**

Course Code	**EE-3004**	**Credits:3**	**L-0,T-0,P-3**
Name of the Course	**ELECTRICAL MACHINE LAB -I**		
Lectures to be delivered.	**39 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks:50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

SECTION-A

1. To find turns ratio & polarity of single –phase transformer.
2. To perform open & short circuit tests on single-phase transformer.
3. To perform Sumpner's (Back to Back) test on two identical transformers.
4. To separate the iron losses occurring in single phase transformer into its components.
5. Parallel operation of two single-phase transformers & to study the load shared by each transformer.
6. To convert three phase to 2-phase By Scott-connection of transformers.

SECTION- B

1. To plot the magnetizing characteristics of a de generator running at rated speed. To obtain and plot the external characteristics of a dc shunt generators & to deduce the internal characteristics from the above.
2. To obtain and plot the external characteristics of a dc shunt generators & to deduce the Internal characteristics from the above.
3. To perform load test on DC shunt generator.
4. Speed control of DC shunt motor.

5. Swinburne's tests of DC shunt motor.
6. To separate the constant losses of dc machine into their components.
7. Parallel operations of dc generators.
8. To obtain and plot the characteristics of DC series motor.
9. To perform low test on DC series motor.
10. To perform the Hopkinson's test on two identical DC machines and to determine the efficiency of motor and generator at various loads.

NOTE: At least 10 experiment to be performed in the semester from the above list.

BOOKS

Experimentation and viva voce on electrical machines by Dr. V.N.Mittle & A. Mittal. Standard Publications.

SEMESTER – IV

TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER EE-4001

Course Code	**EE-4001**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

INTRODUCTION: Structure of a power system, indoor and outdoor substations, equipment for substation layout, auxiliary supply.

DISTRIBUTION SYSTEMS:

Radial,ring mains and network distribution system, comparison of various types of ac and dc systems.

SECTION –B

TRANSMISSION LINES: Introduction: inductance of a conductor due to internal flux and external flux, inductance of a single phase two-wire line, inductance of three phase line, capacitance of three phase line, charging current due to capacitance, skin effect, Ferranti effect, proximity effect.

PERFORMANCE OF LINES: models of short, medium and long transmission lines, performance of transmission lines, circle diagram, capacity of synchronous condenser, tuned lines, voltage control.

SECTION-C

MECHANICAL DESIGN: Sag and stress calculations, effect of ice and wind, string chart, line supports, conductor material, dampers.

INSULATORS: Types, insulating materials, voltage distribution over insulator string, equalizer ring, configuration of insulators for EHV AC & HVDC transmission systems, post insulators, Insulator failures, testing of the insulators.

SECTION-D

CABLES: types of cable, construction of cables, grading of cables, capacitance, ratings, power factor in cables, thermal characteristics and applications.

CORONA: Phenomenon, critical voltage, power loss, reduction in losses & radio- interference,

HVDC Transmission- types of links, advantages and limitations, corona in HVDC lines.

BOOKS

1 Power System Engg: I.J.Nagrath and D.Pkothari (TMH).
2. A Course in Electrical Power: Gupta, Soni & Bhatnagar (Dhanpat Rai & Sons).
3. Power system: Aqshaf Hussain, Dhanpat Rai, Delhi.
4. Elements of power system analysis: W.D. Stevenson (MGH)
5. Electric Power: S.L. Uppal (Khanna Pub.)
6. Electrical Power: J.B.Gupta (S.K.Kataria & Sons).
7. Power system Engineering: B.R.Gupta.
8. Elecric Power System: B.M.Weedy, John Wiley & Sons.
9. Transmission & Distribution of Electrical Engineering: H. Cotton.
10. Transmission & Distribution of Electrical Engineering: Westing House & Oxford Univ. Press.

SEMESTER – IV

ELECTRICAL MACHINE –II **EE-4002**

Course Code	**EE-4002**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTRICAL MACHINE – II**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

THREE PHASE INDUCTION MOTORS

Introduction: construction, comparison of cage & wound rotors, production of rotating field, principle of operation of a 3- phase induction motor, speed & slip, frequency of rotor voltage and current, rotor current, relationship between rotor copper loss and rotor input, torque, winding emf, equivalent circuit, power flow diagram, starting of induction motor, different types of starters.

SECTION – B

THREE PHASE INDUCTION MOTORS

Determination of efficiency, no load and blocked rotor test, construction of circle diagram, high torque cage motors. Comparison between single cage and double cage motors, effect of space harmonic on three phase induction motor performance, cogging and crawling, speed control of induction motors.

SINGLE PHASE MOTORS

Introduction, production of rotating fields, principle, double revolving field theory, rotor slip, equivalent circuit, determination of equivalent circuit parameters, starting methods, types of single-phase induction motors, characteristics and applications of single-phase motors

SECTION- C

SYNCHRONOUS GENERATOR

Introduction, advantages of rotating field alternators, speed and frequency, construction of 3 –phase synchronous machines. Excitation system, emf equation, armature winding, coil span factor, distribution factor, actual voltage generated, armature leakage reactance, armature reaction, synchronous impedance, equivalent circuit & Phasor diagram, voltage regulation, measurement of synchronous impedance. Magnetic axis of the rotor, two reaction theory, Salient pole synchronous machine- two reaction model, torque angle characteristics of salient pole synchronous machine,

maximum reactive power for a synchronous generator, determination of Xd and Xq, parallel operation of alternators, synchronizing power and synchronizing torque coefficient, transient conditions of alternators, constant flux linkage theorem with proof, symmetrical short circuit transients, three phase short circuit on loaded synchronous generator, short circuit ratio, cooling of synchronous generators.

SECTION –D

SYNCHRONOUS MOTORS

Introduction, construction, principle of operation, main features, equivalent circuit and phasor diagram of a cylindrical rotor synchronous motor, different torques in synchronous motor, power flow equation for a synchronous motor, phasor diagram of salient pole synchronous motor, effect of varying field currents, effect of load changes, synchronous motor V curves and inverted V curves, starting of synchronous motors, hunting, comparison between 3- phase synchronous and induction motors, synchronous condenser, applications of synchronous motors.

BOOKS

1. Electrical Machines, Ashfaq Hussain, Dhanpat Rai, Delhi.
2. Electric Machines: I.J. Nagrath and D.P. Kothari, TMH, New Delhi.
3. Performance & Design of D.C. Machines: A.E. Clayton & N.N. Hancock; ELBS.
4. Electric Machinery, Fitzgerald & Kingsley, MGH.
5. Theory of alternating current machinery, A.S.Langsdorf, TMH.
6. Electrical Machinery, P.S.Bhimbra, Khanna Publishers, Delhi.
7. Generalized theory of electrical machine, P.S. Bhimbra, Khanna Publishers, Delhi.

SEMESTER – IV

POWER ELECTRONICS **EE-4004**

Course Code	**EE-4004**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**POWER ELECTRONICS**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (Based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

POWER ELECTRONIC DEVICES: Ratings and protections, series and parallel connections, R,RC, and UJT firing circuit and other firing circuits based on ICs and microprocessors; pulse transformer and opto- coupler, commutation techniques.

SECTION-B

AC REGULATORS: Types of regulator, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage and synchronous tap changer, three phase regulator.

CONVERTERS: One, two, three and six pulse converters, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant/ dual converter, power factor improvement techniques, forced commutated converters, MOSFET and transistor based converters.

SECTION-C

INVERTERS: Basic circuit, 120^{o} and 180^{o} conduction schemes, modified Mc-Murray half bridge and full bridge inverters, Mc-Murray-Bedford half bridge and full bridge inverters, Brief description of parallel and series inverters, Current source inverters (CSI), transistors and MOSFET based inverters.

SECTION-D

CHOPPERS: Basic scheme, output voltage control techniques, one, two and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers.

CYCLO CONVERTERS: Basic principle of frequency conversion, types of cyclo converters, non-circulating and circulating types of cyclo- converters.

BOOKS

1. Power Electronics by M.H.Rashid PHI.
2. Power Electronics by P.C.Sen, TMH.
3. Power Electronics by H.C.Rai, Galgotia.
4. Thyristorised Power Controllers by G.K.Dubey, etal, PHI.
5. Power Electronics by P.S.Bhimra.

SEMESTER – IV

COMMUNICATION ENGINEERING **EE-4006**

Course Code	**EE-4006**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**COMMUNICATION ENGINEERING**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

FREQUENCY BANDS AND SIGNALS: Various frequency bands used for communication and their special features, Need for wireless communication, Types of communication based on modulation systems, types of various signals.

MODULATION TECHNIQUES: Introduction to AM, FM, PM, PCM, PPM, DSBSC, Frequency spectrum of AM Waves, Representations of AM, need and descriptions of SSB, suppression of carrier, suppression of unwanted side bands, vestigial side band system. Mathematical representation of FM, Frequency spectrum of the FM waves, Phase modulation, comparison between analog and digital modulation, wide band and narrow band FM. Sampling theorem, frequency division multiplexing and time division multiplexing.

SECTION-B

AM TRANSMITTERS AND RECEIVERS: AM TRANSMITTERS: Generation of AM, Low Level and High-level modulation, Comparison of levels, AM transmitter block diagram, collector class C modulator, and Base modulator, DSB S/C Modulator.

AM RECEIVER: Tuned radio frequency (TRF) receiver, Super heterodyne receiver, RF section and characteristics, mixer, frequency changing and tracking, IF rejection and IF amplifiers, detection and automatic gain control (AGC), AM receiver characteristics.

SECTION –C

FM TRANSMITTERS AND RECEIVERS: FM TRANSMITTERS: Basic requirement and generation of FM, FM Modulation methods: Direct methods, varacter diode methods, FET REACTANCE MODULATOR, transistor reactance modulation, Pre-emphasis, Direct FM modulator, AFM in reactance modulation, RC phase Shift modulation, Armstrong FM systems.

FM RECEIVERS: Limiters, single and double tuned demodulator, balanced slope detector, foster seely of phase discriminator, de-emphasis, ratio detector, block of FM receiver, RF amplifiers, FM receiver characteristics.

SECTION –D

Broad overview of PCM, DM and ADM. Review of sampling, flat top sampling, quantization, Analog to digital conversion, overview of performance of anlong modulation scheme in presence of noise. Digital modulation techniques (ASK, FSK, BPSK, QPSK, M-ary PSK)

BOOKS

1. Electronic communications systems – Kennedy / TMH.
2. Communications systems – Taub & Schilling / TMH.
3. Communication systems – Simon Haykins / John Wiley & Sons.
4. Communication systems- Bruce Carlson.
5. Communication systems- Singh & Sapre/ TMH

SEMESTER – IV

PULSE SHAPING & WAVE GENERATION **EC-4005**

Course Code	**EC-4005**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**PULSE SHAPING & WAVE GENERATION**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

Linear Wave Shaping:RC,RL and RLC Circuits:
The High- Pass RC circuit (Sine, Pulse, step, Square, Exponential & Ramp Circuits),
The High – Pass Circuit as a Differentiator, the Low Pass RC circuit, the Low- Pass RC circuit as an integrator, RL Circuits, RLC circuits.

Steady – State Switching Characteristics of devices:

The semi conductor diode, the temperature dependence of p-n charac, Diode transition capacitance, Avalanche diode, Diode Resistance, Transistor as a SWITCH, Transistor at Cut – Off, Break down Voltages, Latching Voltages, Reach – through, Transistor SWITCH in Saturation, I/P Charac, Temp. Variation of Saturation parameters.

SECTION-B

(a) Clipping & Comparator Circuits:
Clipping (limiting) circuits, Diode clippers, clipping at two independent levels, comparators, Applications of voltage comparators.

(b) Clamping & Switching Circuits:
Clamping Operation, Clamping circuit with source and diode resistance, clamping circuit theorem, Practical clamping circuits, Transistor as a SWITCH, SWITCH with inductive load , Damper diodes, SWITCH with capacitive load.

SECTION-C

Logic Circuits:
Digital operation of a system, OR-gate, AND – gate, NOT- gate, INHIBIT- operation, XOR-gate, DE- Morgan's Laws, NAND and NOR gates, Registers, Dynamic Registers, Diode Matrices, Resistor- Transistor Logic (RTL and RCTL), Direct coupled Transistor logic (DCTL) Low- level logic, comparison of logic gates.

SECTION-D

Multi Vibrators:

Stable states of a binary, Fixed – bias Transistor binary, Self-bias transistor binary, Monostable multi vibrators.

Sampling gates:

Basic operating principle of gates, Uni-directional diode gate and its other forms, Bi-directional gates using transistors.

Books:
1. The art of Electronics: Paul Horowitz, Winfield Hill.
2. Pulse Shaping & Wave Generation: Milman & Taub.
3. Integrated Electronics: Millman & Halkias.
4. Electronics Devices & Circuits: Millman & Halkias.

SEMESTER – IV

ELECTRICAL AND ELECTRONIC MEASUREMENTS EEE-4001

Course Code	**EEE-4001**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**ELECTRICAL AND ELECTRONICS MEASUREMENTS**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**			

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION – A

MEASUREING INSTRUMENTS: Classification – deflecting, control and damping torques – Ammeters and voltmeters – PMMC, moving iron type instruments. Expression for the defecting torque and control torque- Errors and compensation , extension of range using shunts and series resistance.

SECTION – B

MEASUREMENT OF ENERGY: Single phase induction type energy meter- driving and braking torque – errors and compensations. Three phase energy meter. Maximum demand meters. Types of P.F meters-dynamometer and moving iron type, Frequency meters, Synchoroscopes.

SECTION –C

INSTRUMENT TRANSFORMER AND TRANSDUCERS: Current and potential transformers, constructional features, ratio and phase angle error. Principal and operation of transducers, strain gauge, LVDT, thermocouples, Piczo deetric, crystal and photoelectric transducers.

SECTION – D

ELECTRONIC INSTRUMENTS AND TELEMENTRY : Electronic voltmeter, VTVM Transister voltmeter, Electronic multimeter, CRO's studey of various stages in brief, measurement of voltage, current & Frequency, LCR meter. Introduction to telementary method of data transmission, types of telementary, system and application.

BOOKS RECOMMENDED

1. A.K.Sawhney- Electrical and Electronic Measurements and Instruments.
2. B.Stout – Basic Electrical Measurements.
3. Terman & Petit: Electronic Measurement.
4. D. Cooper – electronic Instruments and Measurement Techniques.

SEMESTER – IV

ELECTRICAL MACHINES- II LAB **EE-4007**

Course Code	**EE-4007**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**ELECTRICAL MACHINES-II LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

INDUCTION MOT0R

1) Single Phase Induction Motor.
   a) No load test.
   b) Block rotor test
2) Three phase slip ring induction motor.
   a) No load test
   b) Block rotor test.
   c) Load test
3) Three phase squirrel cage induction motor
   ‘a) No load test.
   b) Block rotor
   ‘c) Load test.
4) Starting of three phase induction motor.
   a) Stator resistance starting
   b) Reduced voltage starting.
   c) Auto Transformer starting.
   d) Star delta starting.
   e) Rotar resistance starting
   f) Direct online (DOL) starting.
5) Cascading of two induction motor.
6) Speed changing by Pole changing method.

SYNCHRONOUS MACHINE

1. To draw characteristics of alternator under different loading condition.
‘2. To find out regulation by synchronous impedance method.
‘3. To find out regulation by zpf method.
‘4. SYNCHRONISATION
   a) To synchronise a three phase alternator with bus bar
   b) Parallel operation of two alternators.

‘5. V – CURVES OF SYNCHRONOUS MOTOR
   a) To study the effect of variation of field current upon the stator current and p.f With synchronous motor running at no load, draw the V-curves and inverted V-curves of the motor.
‘6. STEADY STATE REACTANCES (X_d X_q) SLIP TEST.
   ‘a) To measure the direct axis synchronous reactance of a synchronous machine.
   b) To measure quadrature axis synchronous reactance by slip test.
‘7 SUBTRANSIENT REACTANCES: X_d”,X_q”
   ‘a) To measure the direct axis synchronous sub transient reactance of a synchronous Machine.
   ‘b) To measure quadrature axis synchronous sub transient reactance of a synchronous Machine.
‘8. NEGATIVE SEQUENCE REACTANCE: X_2
   ‘a) To measure the negative sequence reactance $X_2$of synchronous machine.
‘9. ZERO SEQUENCE REACTANCE: X_0
   ‘a) To measure the zero sequence reactance of synchronous machine.
’10. THREE PHASE CIRCUIT OSCILLOGRAPH.
   ‘a) To record the oscillogram of armature current in various phases under Three phases sudden short circuit.

NOTE: At least 8 experiments should be performed from above list.

BOOKS

Experimentation and viva voce on electrical machines by Dr. V.N.Mittle & A.Mittal.
Standard Publications.

SEMESTER – IV

POWER ELECTRONICS LAB **EE-4008**

Course Code	**EE-4008**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**POWER ELECTRONICS LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. To study Steady-state characteristics of SCR by plotting graph between voltage and current of Thyristers.
2. To Study R and RC Triggering Circuit for SCR.
3. To study UJT as Relaxation Oscillator.
4. To study SCR Half Wave and Full Wave Bridge Controlled Rectifier-Output characteristics.
5. To study 1-Phase Full Wave Bridge Controlled Rectifier using SCR and UJT with R and R-L Load and observe its input/output characteristics with and without free wheeling (commutating) diode.
6. To study three Phase Full-Wave Uncontrolled Rectifier Operation with R and R-L Load and Observe its input/output Characteristics.
7. To study single Phase Cycloconvener output characteristics.
8. Series operation of SCR's.
9. Parallel operation of SCR's.
10. Speed Control of DC motor using SCR's.
11. Lamp-Dimmer Using Diac & Triac With Lamp Load.

Note: Atleast 7 experiments should be performed from above list.

SEMESTER – IV

TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER

EE-4010

Course Code	**EE-4010**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. To find out A,B,C & D parameters, hybrid parameters and image parameters of a given transmission line model.
2. To study the performance of a long transmission line under no load condition and under light load condition.
3. To study the performance of a long transmission line under load at different power factors.
4. Visit to substation and preparing layout of various equipments in the substation.
5. To study the performance characteristics of a typical DC distribution system (Radial Configuration)
6. To study the performance characteristics of a typical DC distribution system (Ring main Configuration)
7. To find out voltage distribution across the string of insulators without guard ring.
8. To find out voltage distribution across the string of insulators with guard ring.
9. To plot equipotential lines of paper model of single layer cable.
10. To plot equipotential lines of paper model of multi layer cable.
11. To measure the insulation resistance of cable.

Note: At least 10 experiments should be performed from above list.

SEMESTER – IV

ELECTRICAL AND ELECTRONICS MEASUREMENT LAB EEE-4002

Course Code	**EEE-4002**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**ELECTRICAL AND ELECTRONICS MEASUREMENT LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks:50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks.)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester.

1. Measurement of resistance using Wheatstone Bridge.
2. Measurement of resistance using kelvin's Bridge.
3. Plotting of Hysteresis loop for a magnetic material using flux meter
4. Measurement of frequency using Wein's Bridge.
5. To study the connections and use of Current and potential transformers and to find out ratio error.
6. Determination of frequency and phase angle using CRO.
7. Measurement of unknown voltage using potentiometer.
8. To find 'Q' of an inductance coil and verify its value using Q-meter.
9. Measure of displacement using LVDT.
10. Measurement of temperature using thermo couple.
11. Measure of pressure using piezo – Electric pick up.
12. Measurement of distance using capactive pick up.
13. Measurement of temperature using R.T.D.

Note: At least 10 experiments are to be done.

SEMESTER – V

ELECTROMAGNETIC FIELD THEORY **EC-5002**

Course Code	**EC-5002**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTROMAGNETIC FIELD THEORY**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION A

INTRODUCTION: Review of vector analysis, Scalar and Vector Product, gradient, divergence, curl and their physical interpretation, line integral, surface, integral, volume integral, strokes theorem, rectangular, cylindrical and spherical co-ordinate system and their transformations.

SECTION-B

ELECTROSTATICS:

Coulomb's Law electrostatic force, Electric field intensity, Electric potential, Electric potential difference, Electric dipole and equipotential surfaces, Electric flux density, displacement flux, Gauss's Law, Capacitance and Capacitors, electrostatic energy.

MAGNETOSTATICS: Inductors and magnetic inductance, back emf, Faradays law of EM induction, Amperes law in differential vector form, Magnetic scalar & vector potential, self & mutual inductance, equation of continuity for steady currents, magnetic field intensity (H) Magnetic flux density (B), ampere force law (Biot Savart Law), energy stored in magnetic field.

SECTION-C

TIME VARYING FIELDS: Equation of continuity for time varying fields, inconsistency of amperes law, displacement current, Maxwell field equation in differential & integral form and their interpretation, uniform plane wave and relation between E and H in uniform plane wave, Intrinsic impedance, boundary conditions.

EM WAVES: Wave equation for free space and conducting medium, phasor on exponential notation of Maxwell's equations, wave propagation in free space and lossy dielectric medium, conductors 7 dielectrics, wave propagation in good dielectrics and good conductors, depth of penetration, reflection & refraction of plane waves at surface of perfect conductor and dielectric (both normal & oblique incidence), surface impedance, energy flow and Poynting theorem.

SECTION-D

TRANSMISSION LINE THEORY: Transmission line as a distributed circuit, basic transmission line equation of transmission line terminated with any load impedance, infinite transmission line, characteristic impedance, open & short circuited line, Reflection coefficient, standing wave ratio and its reflection coefficient, impedance matching.

TEXT BOOKS

1. Electro-magnetic Waves and Radiating System : Jordan & Balmain, PHI.

REFERENCE BOOKS:

1. Engineering Electromagnetic: Haytl TMH.
2. Electro-Magnetic: Krauss JDF; McGraw Hill.

SEMESTER – V

MICROPROCESSORS **EC-5011**

Course Code	**EC-5011**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**MICROPROCESSORS**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Introduction to microprocessors, microprocessor general architecture and its basic operations, microcomputer system: memory and input-output devices, code conversion, BCD arithmetic and 16 bit data operations, BCD to binary and binary to BCD conversion, Binary to ASCII and ASCII to binary conversion.

SECTION-B

8085 Microprocessor: Pin diagram, architecture, Instruction set and timing diagrams, Instruction format and addressing modes, Assembly language programs, debugging of programs, Interrupts and memory interfacing.

SECTION-C

Programming techniques: Looping, counting, indexing, counters and time delays, Illustrative programs, stacks and subroutines.

SECTION-D

Programmable peripheral interfaces-8255 A, programmable interval timer-8253, programmable interrupt controller 8259, Direct-memory access (DMA) and 8257 DMA controller, Microprocessor applications.

TEXT BOOS

1. Microprocessor Architecture, Programming and application with 8085/8080 A by 2. Ramesh S.Gaonkar, Wiley Eastern.
2. Introduction to microprocessors by Aditya P.Mathur, Tata McGraw Hill.
3. Industrial Electronics and control-S.K.Bhattacharya, S.Chatterjee-Tata McGraw Hill.

SEMESTER – V

ELECTRICAL POWER GENERATION **EE-5001**

Course Code	**EE-5001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTRICAL POWER GENERATION**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

LOAD CURVES: Energy requirements, connected load, maximum demand, demand factor, diversity factor, types of load, variation in demand, Chronological load curve, load duration curve, Energy load curve, Mass curve, load factor, Capacity factor, utilization factor.

SECTION-B

CONVENTIONAL METHODS OF GENERATION:

Hydro Stations- location, layout, types and selection of prime mover, calculation of energy generated.

Thermal stations – Location, layout, calculations of energy generated.

Nuclear stations- Principle of nuclear generation, location, layout and calculation of energy generated.

SECTION –C

CLASSIFICATION OF PLANTS: Base load, peak load and stand by stations, stand by capacity in power plants, selection of number and size of units for different types of stations.

POWER STATION AUXILIARIES: Ash handling in thermal plants, necessity of condensers in thermal and nuclear plants, Radiation protection in nuclear plants, station batteries and their maintenance, Fire fighting equipment.

SECTION-D

ECONOMIC OPERATION OF STEAM PLANTS:

Methods of loading turbo alternators, input output curve, heat rate, incremental cost, optimum generator scheduling neglecting transmission loss, sequence of adding units, Elementary treatment of transmission loss and its effect on optimum scheduling load dispatching.

BOOKS

TEXT BOOK:

1. Course in Electrical power by Soni, Gupta, Bhatnagar.

REFERENCE BOOKS:

1. Elements of Electrical Power Station Design by M.V.Deshpande.
2. Power station Engineering and Economics by Strotzky and Uopat.

SEMESTER – V

ELECTRICAL DRIVES AND FACT DEVICES EE-5003

Course Code	**EE-5003**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTRICAL DRIVES AND FACT DEVICES**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (Based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

ELECTRICAL DRIVES: Types, classification, characteristics and their application areas. Selection of electrical drives for electric traction, steel mills, cement mills and textile mills.

SECTION –B

Review of converts, Inverters, Cycloconverters, Choppers etc. and their applications in drive control (AC as well as DC)

SECTION –C

Introduction to FACT controllers.
Principle and operation of Thyristor controlled series capacitors for transmission lines.

SECTION-D

Principle and operation of Thyristor controlled dynamic brake.
Principle and operation of Thyristor controlled var compensators.

TEXT BOOKS

1. Flexible A.C. Transmission System by T.N.Pai.
2. Power Electronics by P.S. Bhimbra.
‘3. Fundamentals of Power Electronics and Drives by A. Chakrabarti. (Dhanpat Rai).

SEMESTER – V

NON CONVENTIONAL ENERGY RESOURCES EEE-5001

Course Code	**EEE-5001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**NON CONVENTIONAL ENERGY RESOURCES**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTRODUCTION: Energy needs and energy supply: Sources,. Conversion and thermodynamical needs and system, Contribution of non conventional energy.

SECTION-B

ENERGY SITUATION AND RENEWABLE ENERGY SOURCES: Global energy scenario, World Energy Consumptions, Energy in developing countries, fire wood crisis, Indian energy scene, Non conventional renewable energy sources, Potential of renewable energy sources.

SECTION-C

SOLAR AND BIO GAS ENERGY: Solar radiations characteristic and estimation. Solar collectors, Flat plate Collectors and concentrating types, their comparative study, Design and material selection, efficiency, selective plants and surfaces. Heating of air and water for buildings and other uses. Thermal storages, solar ponds, solar pumps, solar power, direct conversion of solar energy to electricity and its various uses materials and costs.

Photosynthesis and generation of bio-gas, digesters and their design. Selection of materials. Pyrolytic gasification, production of hydrogen.

SECTION-D

MISCELLANEOUS: Wind energy- Basic principle, component and types.
GEOTHERMAL POSER PLANTS: Introduction, Geothermal Sources. Development of geothermal power in India.

WAVE TIDAL AND OTEC: Introduction, Basic principle of tidal power, wave energy, principle of tidal power plants, ocean thermal energy conversions.

BOOKS:

1. Renewable Energy Sources _ Maheshwar Dyal.
2. An Involution to power plant technology – G.D.Rai.
3. Solar Energy – Suhas.P. Sukhatma, Tata McGraw Hill.
4. Non Conventional Energy Sources by G.D.Rai.
5. Solar Energy Utilization by G.D. Rai.
6. Solar Heating and Cooling by Diffie and Bakeman.

SEMESTER – V

MICROELECTRONICS & LIC **EC-5003**

Course Code	**EC-5003**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**MICROELECTRONICS & LIC**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTEGRATED CIRCUIT TECHNOLOGY: Classification of Integrated Circuits, Monolithic technology, Planar Processes, Fabrication of Devices-diodes, BJT,FET and passive components, Thick and Thin Film technology, Ion implantation Technology, Hybrid Integrated Circuits.

SECTION-B

DIFFERENTIAL & CASCADE AMPLIFIERS: balanced, unbalanced output differential amplifiers, FET differential amplifier, current mirrors, level translators, cascade configuration of amplifiers. OPERATIONAL AMPLIFIERS: Introduction to ideal op-amp, characteristic parameters, interpretation of data sheets, practical op-amp, its equivalent circuit and op-amp circuit configuration.

SECTION –C

OP-AMP WITH NEGATIVE FEEDBACK: Block diagram representation of feedback amplifier, voltage series feedback, voltage shunt feedback, differential amplifiers.

FREQUENCY RESPONSE OF AN OP-AMP: Frequency response, compensating network, frequency response of internally compensated op-amp and non-compensated op-amp. High frequency op-amp equivalent circuit, open loop gain vs. frequency, closed loop frequency response, circuit stability, and slew rate.

SECTION-D

OP-AMP APPLICATIONS: Peaking amplifier, summing, scaling, averaging and instrumentation amplifiers, voltage to current converted, current to voltage converter, very high input impedance circuit, integration, differentiation, wave shaping circuit, active filters, oscillator, comparators and 555 timer.

Reference Books:

1. Op-amp & Linear Integrated Circuits, 2nd Edition by Ramakant A. Gayakward.
2. Linear Integrated Circuits by D.R.Chaudhary.
3. Integrated Circuits by K.R.Botkar.

SEMESTER – V

MICROPROCESSORS LAB **EC(ID) 5006**

Course Code	**EC(ID) 5006**	**Credits:2**	**L-0,T-0,P-3**
Name of the Course	**MICROPROCESSORS LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. Study of 8085 Trainer Kit and awareness of its use along with use manual.
2. Execution of Assembly language programs using the user manual and verification of the programs given in the user manual.
3. Programming practices for various architectural and logical exercises using assembly language on 8085 Kit.
4. Development of delay generating programs using 8085 µP Kit and verification of the delay generated with the help of CRO.
5. Generation of pulse trains using 8085 µP kit and its verification on a CRO.
6. Development of µP based traffic controller.
7. Development of µP based stepper motor controller.
8. Development of µP based temperature controller.
9. Development of µP based Firing circuit for triggering a thyristor.
10. Development of µP based thyristorised speed controller of a dc shunt motor.

NOTE: At least eight experiments to be done from above list.

SEMESTER – V

ELECTRONICS DESIGN LAB **EC-5009**

Course Code	**EC-5009**	**Credits:2**	**L-0,T-0,P-3**
Name of the Course	**ELECTRONICS DESIGN LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. Design of Power Supply of 12 V.
2. Design a Single stage amplifier.
3. Design a combinational Circuits which multiplies two, two bit binary numbers.
4. Design a MOD-8 counter using J-K F/F.
5. (a) Design of Differentiator to differentiate a input signal that varies in frequency from 10 Hz to 1KHz.
   (b) Design a integrator circuit to process input sinusoidal Wave forms p to 1 KHz by input amplitude is 10 mV.
6. (a) Design a Second order LPF at a high cut off frequency of 1 KHz.
   (b) Design a Second order HPF cut off filter of 1 KHz with a pass band gain of 2.
7. (a) Design a wideband pass filter with FL=200 KHz and FH=1KHz and a pass band gain of 4.
   (b) Design a 60 Hz active notch filter.
8. Design a square wave generator using 555 timer.
9. Design a R.C phase shift Oscillator using 741 IC.
10. Design a Wein bridge oscillator using 741 IC.

SEMESTER – VI

ADVANCE MICROPROCESSOR AND CONTROLLER (MICRO & PLC) LAB **EC-6012**

Course Code	**EC-6012**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ADVANCED MICROPROCESSOR AND CONTROLLER (MICRO & PLC)**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

Introduction to microprocessors, microcomputers and computers, batch processing, multiprocessing, multiprogramming, Time sharing and multitasking system, classification of microprocessors – 8086, 80186, 80286, 80386 and 80486.

SECTION-B

Introduction of 16-bit microprocessors, 8086, architecture, programming model, segmented memory, memory map, segment registers, Addressing modes, data transfer instructions, string instructions, logical instructions, Arithmetic instructions, Transfer of control instructions, process control instructions.

SECTION-C

8051 Series micro controllers- architecture, pin diagram, basic instruction set, applications of micro controllers as dedicated controllers.

SECTION-D

Architecture of programmable logic controllers (PLCs), Input – output modules, programming of PLC using ladder logic.

TEXT BOOKS

1. The 8086/8088 family design, programming and interfacing – John Uffenbeck, Prentice Hall of India.
2. Microcomputer system- The 8086/80-88 family architecture, programming and design by Y.C.Lin, G.A. Gibson, Prentice of India.
3. Programmable logic controller – J.R.Hackworch-Jr Pearson Education.
4. Introduction to programmable logic controller – G.Dunning (Delmer Publications)

SEMESTER – VI

SWITCHGEAR AND PROTECTION **EE-6001**

Course Code	**EE-6001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**SWITCHGEAR AND PROTECTION**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

RELAYS: Operating Principles, constructional, features and characteristics of relays. Relay classification, principle types of electromagnetic relays, theory of Induction relays, relay design, general equation for electromagnetic relays, general equation of comparators, Over current relays, instantaneous over current relay, Directional relays, Distance relays, Differential relays.

SECTION –B

FEEDER PROTECTION: Over current protection, Distance protection, Pilot protection.
APPARATUS PROTECTION: Transformer protection, generator protection, Motor protection, Bus bar protection, C.T.s, P.T.s and their application in protective schemes.

SECTION –C

STATIC RELAYS: Basic concepts, Input Output devices and circuits, Phase and amplitude comparator, general organization of static relays.

PROTECTION AGAINST OVER VOLTAGES: Ground wire, shielding angle, rod gap, horn gap, impulse gap, valve type and non linear arrestors, surge absorbers.
FUSES: Types, ratings, theory and characteristics, characteristics and construction of HRC fuses.

SECTION –D

THEORY OF CIRCUIT INTERRUPTION: Physics of arc interruption, maintenance of arc, interruption theories.
CIRCUIT CONSTANTS IN RELATION TO CIRCUIT BREAKING: Circuit breaker rating, circuit constants and circuit conditions, Restriking voltage.

THEORY OF CIRCUIT BREAKERS: Air break circuit breaker, oil circuit breaker, Air blast circuit beaker, Vacuum circuit breaker, SF_6circuit breaker, circuit breaking in HVDC systems, Testing and maintenance of circuit breakers.

BOOKS

1. A course in Electrical power by Soni, Gupta, Bhatnagar.
2. Power System Protection and Switchgear by B. Ravinder Nath & M. Chander, Wiley Eastern.
3. Switchgear and Protection by Sunil S.Rao.
4. Art and Science of Protective relaying by C.R.Mason, John Wiley.
5. Electrical Power Systems by C.L.Wadhwa.

SEMESTER – VI

ENERGY MANAGEMENT **EE-6002**

Course Code	**EE-6002**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ENERGY MANAGEMENT**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (Based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five sections A, B, C, and D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A, B, C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

Significance of Energy Management in the present scenario, Role and responsibilities of an Energy Manager, Basic Principles of supply side Management (SSM) and demand Side Management (DSM).

SECTION-B

ENERGY AUDIT: Types of Energy Audits, National Energy Plan and its impact on Energy Conservation, Energy accounting and analysis.

SECTION –C

MEASURING INSTRUMENTS: Temperature measuring instruments, combustion system measuring instruments, measurement of heating, ventilation and air conditioning system performance.

SECTION-D

ENERGY AUDITS PRACTICE: Energy Audits of building systems, electrical systems, maintenance and Energy Audits.

BOOKS

1. Handbook of Energy Audits by Albert Thuman – Fairman Press Inc.
2. Energy Technology by S. Rao, Khanna Publishers.

SEMESTER – VI

ELECTRICAL ENERGY UTILIZATION **EE-6004**

Course Code	**EE-6004**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTRICAL ENERGY UTILISATION**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

'1. For Paper Setters: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

'2 For candidates: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

ELECTRIC TRACTION: Different systems of traction – their comparison, types of motors for traction, systems of track electrification, speed time curves, energy consumption.

CURRENT COLLECTION SYSTEM: Conductor rail system, overhead equipment system- Pole collector, bow collector, Pantograph collector, air blast circuit breaker.

CONTROL OF DC MOTORS: Series parallel control, drum controller, contractor type controller, energy saving with series parallel starting.

MECHANICS OF BRAKING: Mechanical brakes, Electric braking – Plugging, rheostatic braking, regenerative braking.

SECTION – B

ELECTRIC ENERGY AS LIGHT: Production of light by different methods, units of quantities used in study of light, Laws of illumination, different light sources – their construction and operating principle, design of lighting schemes and equipment used, Indoor, roadway, industrial and flood lighting.

SECTION – C

ELECTRIC HEATING: Different methods of electric heating, Constructional details and performance of resistance heating furnaces, heating elements design, ovens, direct and indirect induction and arc furnaces, estimation of power and energy requirement, power supply problems.

SECTION – D

ELECTRICAL WELDING: AC and DC welding, resistance arc and atomic hydrogen welding, electron beam welding, ultrasonic welding, laser welding, different types of control equipment used for controlling temperature and pressure in arc and resistance welding, welding transformer.

BOOKS

1. Art and Science of Utilization of Electrical Energy by H.Partab.
2. Utilization of Electrical Energy by Openshaw Taylor.

SEMESTER – VI

LINEAR CONTROL SYSTEMS **EC-6004**

Course Code	**EC-6004**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**LINEAR CONTROL SYSTEMS**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

'1. For Paper Setters: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

'2 For candidates: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Introduction

The control system, historical development of automatic control system, sampled data digital control system.

Mathematical Models of Physical Systems:

Differential equation of physical systems, transfer function, block diagram algebra, signal Flow graphs.

Feedback characteristics of control systems:

Feedback and Non-feedback systems, Reduction of parameter variations by use of feedback, control over system Dynamics by use of feedback, control of the effects of Disturbance signals by use of feedback.

SECTION-B

Time Response Analysis:

Transient and steady state response, Input Test Signals, Time response of a first over and second order control systems, Steady State Error, Control Actions.

Stability:
The concept of stability, Necessary conditions for stability, Routh – Hurtwitz stability criterion.
Root Locus Technique:
The Root Locus concept, construction of root loci.

SECTION –C
Frequency Response Analysis:

Correlation between Time and Frequency Response, Polar plots, Bode plots.

Stability in Frequency Domain:
Nyquist stability Criterion, Assessment of Relative Stability using Nyquist Criterion.

SECTION-D
Compensation of Control Systems:
Phase lead compensation, phase lag compensation, phase lag – lead compensation, Feedback compensation.

State Variable Analysis:
State space Representation, the concept of state, State space Representation of Systems, Block diagram for state equation, controllability, observability.

Books Recommended:

1. "Control Systems Engineering" Nagrath & Gopal, New Age International Publishers.
2. "Linear Control Systems", B.S. Manke, Khanna Publishers.
3. "Automatic Control System", KUO, PHI.

SEMESTER – VI

ELECTRONIC LOGIC CIRCUIT DESIGN EEE-6001

Course Code	**EEE-6001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ELECTRONIC LOGIC CIRCUIT DESIGN**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A
SEQUENTIAL CIRCUITS:
Switching circuits and types of switching circuits. Asynchronous and synchronous circuits, state diagram and state table.

SECTION –B
DESIGN OF SEQUENTIAL LOGIC CIRCUIT.
Introduction, register and application of shift register, asynchronous counters and their types. . Design of counters.

DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUIT.

Introduction to sequential circuit with example - Basic definition, capabilities and limitation of finite state machines, state equivalence & machine minimization, simplification of incompletely specified machines, synthesis & analysis of synchronous sequential circuits.

SECTION – C
DESIGN OF ASYNCHRONOUS SEQUENTIAL CIRCUITS:

Introduction to asynchronous circuits, timing diagram, state diagram & flow tables, fundamental mode circuits, synthesis, state assignment in asynchronous sequential circuits, pulse mode circuits.

SECTION-D
HASARDS:

Introduction, gate delays, generation of spikes, production of static hazards in combinational networks, elimination of static hazards, design of hazard free combinational networks, hazard free asynchronous circuit design & essential hazards.

DECOMPOSITION OF SEQUENTIAL SYSTEMS:

Conditions for serial and parallel decomposition. Advantages and disadvantages of modularity, types of decomposition,.

BOOKS RECOMMENDED:

1. Logical design of switching circuits – Douglas Lewin.
2. Switching and finite automata theory – ZVI Kohavi.

SEMESTER – VI

ADVANCED MICROPROCESSOR AND CONTROLLER (MICRO & PLC) LAB

EC-6013

Course Code	**EC-6013**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**ADVANCED MICROPROCESSOR AND CONTROLLER (MICRO & PLC) LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. Program practice on 8086 kit.
2. Interfacing of 8086 with PC and downloading programming using compilers.
3. Application of 8086 for temperature control.
4. Simple programming on 8051 micro controllers.
5. Interfacing of 8051 with PC and downloading of program.
6. Application of 8051 as a stand alone (dedicated) controller.
7. PLC Programming practices using ladder logic.

Note: At least five experiments to be performed from above list.

SEMESTER – VI

SWITCHGEAR AND PROTECTION LAB EE-6006

Course Code	**EE-6006**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**SWITCHGEAR AND PROTECTION LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. Symmetrical fault level analysis on a d.c network analyzer.
2. Unsymmetrical fault level analysis on a d.c. Network for various type of faults.
3. Symmetrical fault level analysis on an a.c network analyzer.
4. Unsymmetrical fault level analysis on an a.c network for various types of faults.
5. To plot time current characteristics of Electromagnetic type over-current relay.
6. To plot time-current characteristics of an IDMT relay.
7. Performance and study of Merz-Price protection.
8. Study of the performance and operation of a three phase over-current and earth fault static relay.

Note: At least six experiments to be done from above list.

SEMESTER – VI

CONTROL SYSTEM LAB **EC-6008**

Course Code	**EC-6008**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**CONTROL SYSTEM LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the semester

LIST OF EXPERIMENTS

1. To illustrate a simple motor driven open loop position control system.
2. To demonstrate simple motor driven closed loop position control system.
3. To study and demonstrate simple closed loop speed control system.
4. To study the lag compensator and to draw magnitude and phase plots for these.
5. To draw the magnitude and phase plots for lead and lag-lead compensators.
6. To study a stepper motor and to execute microprocessor or computer passed control of the same by changing number of steps, direction of rotation and speed.
7. To plot torque – speed characteristics of ac servomotor.
8. To plot torque – speed characteristics of dc servomotor.
9. To study magnetic amplifier.
10. To study synchro transmitter rotor position vs. stator voltages and the working of synchro receiver position.
11. To study second order system and obtain its time response for different damping factors

SEMESTER – VI

ELECTRONIC CIRCUIT SIMULATION LAB **EEE-6002**

Course Code	**EEE-6002**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**ELECTRONIC CIRCUIT SIMULATION LAB**		
Lectures to be delivered.	**39 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max. Marks: 50**	**Max. Marks: 25**

Instructions for paper setter/Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)

ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed/projects executed by the candidate related to the paper during the course of the

LIST OF EXPERIMENTS:

1. Design of half wave and full wave rectifier.
2. Design of voltage regulator using Zener diode.
3. Design of common base and common emitter single stage amplifier.
4. Design of a ring counter and twisted ring counter.
5. Design of a biased diode clipper.
6. Verify the operations of OR, AND, NOT, NOR, NAND and XOR gates.
7. Design of a mod – 8 up and down counter.
8. Design a square wave generator using IC555 timer.

SEMESTER – VII

T.V ENGINEERING **EC-7001**

Course Code	**EC-7001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**T.V.ENGINEERING**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A
PRINCIPLES OF TV:

- Picture elements, Theory of line, frame and field frequencies Blanking, Synchronization, interfacing, resolution, vertical resolution, horizontal resolution and video bandwidth. Use of AM in video and FM in audio.
- Block Diagram of TV Transmitter and Receiver.
- Construction of composite video signal.

SECTION –B
TELEVISION CAMERAS AND PICTURE TUBES:

- Spectrum of light and eye response.
- Image orthicon, plumbicon, vidicon (Principles of operation, Construction and working)
- TV picture tube details.
- Modulation system used for sound and picture.
- VSB working.
- TV transmitter.

SECTION-C
TV RECEIVER:
Block diagram of TV Receiver, Tuner Circuits, choice of IF amplifier, A.M. & F.M. detectors, Receiver sweep circuits, Video Frequency amplifier, synch. Pulse representation, deflection circuits.

SECTION-D
COLOUR TV
Hue, Saturation and luminance, Luminance and colour signal generation, colour picture tubes (Basic principles and construction), colour subcarrier and colour triangle.

- NTPC, PAL, SECAM systems.
- Colour TV transmission & reception.
- Block diagram of digital TV with merits.

Books Recommended:

1. Gulati R.R.- Monochrome & Colour TV.
2. Grob G.M. – 'BASIC Television' McGraw Hills'.
3. Dhake TV Engg. – Tata McGraw Hills.

SEMESTER – VII

BIOMEDICAL ELECTRONICS **EC-7006**

Course Code	**EC-7006**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**BIOMEDICAL ELECTRONICS**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

BIOELECTRIC SIGNALS:Origin and Electrodes for ECG,EEG and EMG signals.

PSYCHOLOGICAL TRANSDUCERS:- Pressure and temperature Transducers, Pulse sensors, Respiration Sensors.

PATIENT SAFETY: Electric sock Hazards, Leakage currents instrument for checking safety parameters.

SECTION-B

RECORDING SYSTEM: Basic recording system, sources of noise in low level recording circuits, pre amplifiers, drivers, various types of records-Inkjet, Potentiometer,UV, thermal array, electrostatic, light gate array.

BIOMEDICAL RECORDS:- Electrocardiograph, phonocardiograph, Electroencephalograph, Electromyograph.

SECTION –C

MEDICAL DISPLAY SYSTEM:- Oscilloscopes, cardio scope, multichannel display, Nonfade display system.

IMAGE SYSTEMS:- Introduction Basic Principle& Block Diagram of X-ray Machine, Computer Tomography and Nuclear Magnetic Resonance (NMR) Tomography, Ultrasonic Imaging Systems, Ultrasound.

SECTION-D

CARDIAC PACEMAKERS: Externals, implantable & Programmable pacemakers, power sources for implantable pacemakers, Leads and electrodes.

CARDIAC DEFIBRILLATOR:- DC – Defibrillators, Defibrillator Electronic, Implantable defibrillators.

BIO-TELEMETRY:- Wireless telemetry system, multichannel wireless telemetry.

PATIENT MONITORING SYSTEM.

Reference Books:

1. Hand Book of Biomedical instrumentation- R.S. Khandpur (TMH)
2. Biomedical Electronics- Cromwell., PHI.
3. Biomedical Instruments Theory and design by Walter Welko Witiz.

SEMESTER – VII

POWER SYSTEM OPERATION AND CONTROL **EE- 7002**

Course Code	**EE-7002**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**POWER SYSTEM OPERATION AND CONTROL**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (Based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

CHARACTERISTIC OF POWER GENERATION UNITS: Characteristics of steam units, characteristic of hydro-units, Input Output and incremental fuel cost characteristics.
UNIT COMMITMENT: Constraints in unit commitment, solution of the unit commitment problem by Priority list method and Forward Dynamic Programming Approach.

SECTION-B

ECONOMIC DISPATCH OF THERMAL UNITS: Economic dispatch problem, thermal system dispatching with network losses considered, Base point and participation factors, Line loss formula (derivation not included), solution of co-ordination equations by iteration method and Newton – Raphson method.

SECTION-C

HYDRO-THERMAL CO-ORDINATION: Short term hydro- thermal scheduling problem, solution of co-ordination equations by iteration method, Dynamic programming, dynamic programming application to hydro-thermal problem.

SECTION-D

POWER SYSTEM CONTROLS: Generator voltage control, Turbine governer control, load frequency control, co-ordination of economic dispatching with load frequency control.

BOOKS

1. Power generation operation and control by A.J. Wood and B.F. Wollenberg, John Wiley & Sons.
2. Power System Engineering by Nagrath & Kothari, TMH.

3. Power System Analysis and Design by B.R.Gupta, Wheeler.

SEMESTER – VII

ENTREPRENEUR DEVELOPMENT **EE-7003**

Course Code	**EE-7003**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**ENTREPRENEUR DEVELOPMENT**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 foreach semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

'1. For Paper Setters: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

'2 For candidates: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION A

Entrepreneurship: Entrepreneurship, Role of entrepreneurship in Indian economy, Characteristics of entrepreneur, Types of entrepreneurs, some myths and realities about entrepreneurship.

Small scale industries: Introduction, Role and scope of small-scale industries, concept of small scale and ancillary industries undertaking. How to start a small scale industry, steps in launching own venture, procedure for registration of small scale industries, various development agencies- their functions and role in industrial and entrepreneurship development, infrastructure facilities available for entrepreneurship development in India.

SECTION B

Product planning and Development: Introduction, Requirement of a good product design, product development approaches, Product development process, Elements of concurrent engineering, quality function development, Rapid prototyping, Various controlling agencies involved; their role and formalities for getting clearance before starting individual venture.

SECTION C

Preparation of feasibility Project Report: Tools for evolution of techno economic feasibility project report, SWOT analysis.

SECTION D

Elements of Marketing & Scales Management: Nature of product and market strategy, packing and advertising, after sales service, social responsibility and business ethics.

Important Legal Provisions: Sales of good act, partnership act, packing and advertising, after sales service, social responsibility and business ethics.

BOOKS

Text Books:

1. The practice of Entrepreneurship – G.G. Meredikh, R.E. Nelson and P.A.Neek.
2. Handbook of Entrepreneurship – Rao and Pareek.

Reference Books:

1. Engineering Economics -Tarachand
2. Industrial Engineering and Management -Ravi Shanker.
3. Industrial Engineering and Management -O.P.Khanna – Dhanpat Rai & Sons, New Delhi

SEMESTER – VII

DIGITAL SYSTEM DESIGN **EC(ID)7005**

Course Code	**EC(ID)7005**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**DIGITAL SYSTEM DESIGN**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION – A

INTRODUCTION

Introduction to Computer aided design tools for digital systems. Hardware description languages; introduction to VHDL, data objects, classes and data types, Operators, Overloading, Logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioral, data flow and structural models.

SECTION –B

VHDL STATEMENTS:

Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements.

Subprograms: Application of Functions and Procedures, Structural Modeling, component declaration, structural layout and generies.

SECTION – C

COMBINATION CIRCUIT DESIGN:

VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

SEQUENTIAL CIRCUITS DESIGN:

VHDL Models and Simulation of Sequential circuits.

Shift Registers, Counters etc.

SECTION – D

DESIGN OF MICROCOMPUTER:

Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL.

DESIGN WITH CPLDs AND FPGAs:

Programmable logic devices: ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design implementation using CPLDs and FPGAs.

REFERENCE BOOKS:

1. IEEE Standard VHDL Language Reference Manual (1993).
2. Digital Design and Modelling with VHDL and Synthesis: KC Chang; IEEE Computer society Press.
3. "A VHDL Primmer": Bhasker; Prentice Hall 1995.
4. "Digital system Design using VHDL". Charles.H.Roth; PWS (1998).
5. "VHDL – Analysis & Modelling of Digital Systems" : Navabi Z; McGraw Hill.
6. VHDL – IV Edition: Perry TMH (2002)
7. "Introduction to Digital Systems": Ercegovac. Lang & Moreno; John Wiley (1999)
8. Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic; TMH (2000)
9. Modern Digital Electronics – III Edition: R.P.Jain; TMH (2003).

SEMESTER – VII

HIGH VOLTAGE ENGINEERING & D.C. EEE-7004

Course Code	**EEE-7004**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**HIGH VOLTAGE ENGINEERING & D.C**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (Based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**			

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

DISCHARGE PHENOMENON IN GASES: General properties of gaseous insulation, processes of ionization in a gas, discharges process in uniform and non-uniform fields, , Corona effect due to direct and alternating voltages, commonly used gases for insulation. Paschen's law.

BREAKDOWN OF SOLIDS AND LIQUIDS: Different mechanisms of breakdown of solids, Intrinsic breakdown, theories of intrinsic breakdown in liquids. Theories of breakdown in liquid, commonly used solid and liquid insulating materials.

SECTION-B

LIGHTNING PHENOMENON: Types of charges in clouds and formation of lightning stroke, types of lightning stroke, protection of transmission lines and substations against lightning, different types of lightning arrestors and switching surges.

HIGH VOLTAGE TESTING EQUIPMENT: High voltage testing transformer, rating of different kind of equipments for testing. Generation of high direct voltage by voltage double circuit and Cockrort Walton circuit.

SECTION –C

HIGH VOLTAGE MEASUREMENTS: Measurement of ac, dc and impulse voltage, sphere gap, resistance and capacitance potential dividers, High voltage measurements by measuring rectified current of a standard capacitor, Creat voltmeter, Electrostatic voltmeter, Impulse voltage measurement by CRO.

IMPULSE GENERATOR: Definition of impulse wave, different types of impulse generators and there equivalent circuits, determination of front and tail resistance to produce a given wave shape.

SECTION –D

HVDC: Advantages & disadvantages of HVDC transmission systems, types of HVDC systems, bipolar, monopolar, back –to–back and operation of an H.V.D.C link, circuit breakers, HVDC circuit breaker capabilities and characteristics, requirement of HVDC system, layout of HVDC substation.

BOOKS

1 High Voltage Engineering – by C.L. Wadhwa

2. Power System Transients and High Voltage Principles – by B.Thapar, B.R.Gupta & L.K.Khera.

3. High Voltage Engineering by M.S. Naidu & V.K.Kamaraju.

4. A course in Electrical Power by Soni, Gupta, Bhatnagar.

SEMESTER – VII

T.V ENGINEERING LAB **EC-7007**

Course Code	**EC-7007**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**T.V.ENGINEERING LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max Marks: 50**	**Min.Pass Marks: 25**

Instructions for paper setter /Candidates.

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks).

ii) Viva-voce examination (25 marks).

Viva-voce examination will be related to the practical performed/ projects executed by the candidate related to the paper during the course of the semester.

LIST OF EXPERIMENTS:

1. To identify Receiver components and locate different stages on the chasis of Black & white Receiver.
2. To identify Receiver components and locate different stages on the chasis of PAL colour TV Receiver.
3. To operate various controls of TV Receiver and observe their effect on Black & White Receiver.
4. To operate various controls of different stages on PAL colour TV Receiver.
5. To know dc voltages and waveforms at various points in a Black & White TV Receiver.
6. To know dc voltages and waveforms at various points in a colour TV receiver.
7. To observe the effect of brightness control on grid to cathode bias of CRT and note cut off bias for CRT.
8. To observe the effect of contrast control on luminance signal at cathode of CRT.
9. To use a colour pattern generator and subjectively evaluate Raster reproduction.
10. To install and study satellite TV Receiver system including Dish Antenna and Receiver.
11. To study typical faults in different sections of Black & White TV Receiver.
12. To study typical faults in different sections of PAL colour TV Receiver.

SEMESTER – VII

DIGITAL SYSTEM DESIGN LAB **EC-7010**

Course Code	**EC-7010**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**DIGITAL SYSTEM DESIGN LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	**Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)**	**Max Marks: 50**	**Min.Pass Marks: 25**

Instructions for paper setter/ Candidates

Laboratory examination will consist of two parts:

I) Performing a practical examination assigned by the examiner (25 marks).

II) Viva-voce examination (25 marks).

Viva-voce examination will be related to the practical performed/ projects executed by the candidate related to the paper during the course of the semester.

LIST OF EXPERIMENTS:

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the waveforms and the hardware generated.
   a) Half adder.
   b) Full adder.
3. Write VHDL programs for the following circuits, check the waveforms and the hardware Generated.
   a) Multiplexer.
   b) Demultiplexer.
4. Write VHDL programs for the following circuits, check the waveforms and the hardware generated.
   a) Decoder.
   b) Encoder.
5. Write a VHDL programs for a comparator and check the waveforms and the hardware generated.
6. Write a VHDL programs for a flip-flop and check the waveforms and the hardware generated.
7. Write a VHDL programs for a counter and check the waveforms and the hardware generated.
8. Write a VHDL programs for a code converter and check the waveforms and the hardware generated.
9. Write a VHDL programs for a following circuits and check the waveforms and the Hardware generated.
   a) Register.

b) Shift register

10. Implement any three (given above) on FPGA/CPLD kit.

SEMESTER – VII

ENTREPRENEUR DEVELOPMENT LAB EE-7007

Course Code	**EE-7007**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**ENTREPRENEUR DEVELOPMENT LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	**Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)**	**Max Marks: 50**	**Min.Pass Marks: 25**

Instructions for paper setter / Candidates

Laboratory examination will consist of two parts:

i) Performing a practical examination assigned by the examiner (25 marks)
ii) Viva-voce examination (25 marks)

Viva-voce examination will be related to the practicals performed / projects executed by the candidate related to the paper during the course of the semester.

LIST OF EXPERIMENTS

1. Familiarization to entrepreneurship and its development in India.
2. Collect the data from nearby existing small-scale industries.
3. Analysis of data and their different aspects.
4. Suggestions, recommendation, improvements for the plant.
5. To prepare the project report.
6. Case – Study.

SEMESTER – VIII

DIGITAL SIGNAL PROCESSING **EC(ID) -8001**

Course Code	**EC(ID) -8001**	**Credits: 4**	**L-3,T-1, P-0**
Name of the Course	**DIGITAL SIGNAL PROCESSING**		
Lectures to be delivered.	**52(1 Hr Each) (L=39, T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Discrete-time signal analysis and linear systems: Signal analysis – signal characteristics- typical discrete – time signals – operation on signals – properties of linear time – invariant digital systems – Fourier transform relationship – sampling analog signals and sampling rate conversion. Z-transform; Properties of Z-transform, Inverse Z-transform – Analysis of discrete time systems, convolution.

SECTION –B

System function, difference eqution
IIR filter design: analog filter approximation, Butterworth, Chebyshev and elliptic filters, bilinear transformations, impulse invariance technique, digital frequency band transformations, FIR filter design using windows technique, equiripple approximation technique, frequency sampling technique.

SECTION – C

Discrete Fourier transform (DFT) and inverse Discrete time Fourier Transform: properties – circular convolution. Fast Fourier Transform (FFT): Decimation-in-time (DIT) algorithm-decimation-in-frequency algorithm – FFT, Radix –2 DIT and DIF implementation.

SECTION – D

Finite Register Length Effects: Quantization noise introduced by analog-to-digital conversion-finite register length effects in the realization of IIR and FIR digital filters and in DFT computation. IIR and FIR filter realization scheme.

BOOKS

Text Books:

1. David. K. Defatta, Joseph G, Lucas and William S. Hodgkiss, Digital Signal Processing, John Wiley & sons, 1988.
2. Sanjit K and Mitra, Digital Signal Processing, Tata McFraw Hill, 1998.

Reference Books:

1. A.V.Oppeheim and R.W.Schaffer, Digital Signal and Processing, Prentice Hall.
2. Farooq Hussain, Digital Signal and Processing, Prentice Hall.

SEMESTER – VIII

SYSTEM SOFTWARE **CS-8001**

Course Code	**CS-8001**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**SYSTEM SOFTWARE**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION-A

Machine Architecture, instruction set, addressing modes of the chosen machine, arithmetic & logic operations, floating point operations.

C Programming: Reviews of syntax of C with emphasis on feature like pointers. Bit operations, Pre-processor, files.

SECTION-B

Assemblers, Cross Assemblers: Two pass assembler design. Data structure and algorithms.

Macro processor: Definitions nested macro- definitions, macro expansion, and conditional macro-expansion.

SECTION-C

Linking, Loading, and Relocation, Static and Dynamic linking, Loading and relocation. Editors, debuggers, interactive programming environments.

SECTION-D

DOS: Introduction to interrupts, structure of the interrupt vector table, internet types, software interrupts, Hardware interrupts, interrupts at a glance, interrupts calla from C, internal structure of DOS, Booting Dos, Com & Exe Programs, BIOS, Memory resident programs. Running Batch file.

Programming Examples of Text handling, file management, interface and device drivers, programming in C.

Suggested Text Books & References.

1. Donovan, J.J.,"System Programming", Tata McGraw Hill.

2. Dhamdhare, D.M., "Introduction to System Software", Tata McGraw Hill.
3. Dhamdhare,D.M., "system Programming & Operating System", Tata McGraw Hill.

SEMESTER – VIII

COMPUTER APPLICATIONS TO POWER SYSTEM ANALYSIS EE-8002

Course Code	**EE-8002**	**Credits: 4**	**L-3,T-1, P-0**
Name of the Course	**COMPUTER APPLICATIONS TO POWER SYSTEM ANALYSIS**		
Lectures to be delivered.	**52(1 Hr Each) (L=39, T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTRODUCTION: System view point regarding Computer Aided power Systems Analysis, Simulation, Hierarchy of transmission and distribution system, Review of power system parameters and representation, ABCD constants of a transmission system, Analytical derivation of network matrices, formation of Z_{BUS} and Y_{BUS} matrices, building algorithms.

SECTION – B

SHORT CIRCUIT STUDIES: Review of symmetrical components, interconnection of sequence networks for three phase single line to ground, line to line, double line to ground and open conductor faults.

SECTION – C

POWER FLOW STUDIES: The power flow problem, power flow solution by Gauss – Siedal, Newton Raphson and Fast decoupled methods, Sparsity techniques, Control of power flow.

SECTION – D

TRANSIENT STABILITY STUDIES: The swing equation, simplified synchronous machine model and system equivalents, equal area criterion, numerical integration of swing equation, multi machine stability, Design methods for improving transient stability.

BOOKS

1. Modern Power System Analysis by I.J.Nagrath & D.P.Kothari.
2. Power System Analysis and Design with Prsonal Computer Application by J.D. Glover and M.Sharma, PWS –KENT Publishing Company.
3. Computer Techniques to Power System Analysis by M.A.Pai.
4. Power System Analysis by J.J. Grainger and W.D.Steverson, MGH.
5. Electrical Power Systems by C.L.Wadhwa.
6. Power System Analysis and Design by B.R.Gupta.
7. Computer methods in power system analysis by G.W.Stagg and A.H.Li Abiad.

SEMESTER – VIII

POWER PLANT ENGINEERING **EEE-8001**

Course Code	**EEE-8001**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**POWER PLANT ENGINEERING**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.

2 **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

THERMAL STATIONS: Main parts and working of stations, thermodynamic cycles, fuel handling, combustion and combustion equipment, problem of ash disposal, circulating water schemes and supply of make-up water, choice of pressure of steam generation and steam temperature, selection of appropriate vacuum economizer, air pre-heater feed water heaters and dust collection. Characteristics of turbo alternator, steam power plant, heat balance and efficiency.

Boilers and steam generation, general classification, fire tube and water tube boiler, natural circulation and forced circulation boilers, high pressure, high temperature boilers, supercritical pressure boilers, boiler mountings and accessories, feed pumps, economizers, superheaters, air preheaters; boiler furnaces, heat generation rates, waterwalls.

SECTION-B

HYDRO-ELECTRIC PLANTS: Hydrology, steam flow, hydrograph flow duration curves. Types of hydroelectric plants and their field of use, capacity turbine governors. Hydroplant auxiliaries, plant layout, automatic and remote control of hydroplants, pumped storage projects, cost of hydroelectric project.

GAS TURBINE PLANTS: Plant layout, methods of improving output and performance. Fuels and fuel systems. Methods of testing. Open and closed cycle plants. Operating characteristic. Applications Free piston engine plants, limitation and applications.

SECTION-C

NUCLEAR POWER PLANTS: Elements of nuclear power plant, nuclear reactor, fuels, moderators, coolants, control. Classification of nuclear power layout stations. Cost of nuclear power.

DIESEL POWER PLANTS: Diesel engine performance and operation. Plant layout. Log sheets. Applications. Selections of engine size.

SECTION-D

COMBINED WORKING OF POWER PLANTS: Advantages of combined working of different types of power plants. Need for coordination of types of power plants in power system base load stations and peak load stations.

MAJOR ELECTRICAL EQUIPMENT IN POWER PLANTS: Generators and exciters, earthing of a power system, power and unit transformers, circuit breakers, protective equipment control board equipment, elements of instrumentation, plant layout, switchgear for power station auxiliaries.

BOOKS

1. Power Plant Engineering by G.R.Nagpal.
2. Power Plant Engineering by P.C. Sharma.

SEMESTER – VIII

DIGITAL SIGNAL PROCESSING LAB **EC (ID) -8006**

Course Code	**EC (ID) -8006**	**Credits:2**	**L-0,T-0,P-3**
Name of the Course	**DIGITAL SIGNAL PROCESSING LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max Marks: 50**	**Min.Pass Marks: 25**

Instructions for paper setter /Candidates.

Laboratory examination will consist of two parts:
i) Performing a practical examination assigned by the examiner (25 marks).
ii) Viva-voce examination (25 marks).

Viva-voce examination will be related to the practical performed/ projects executed by the candidate related to the paper during the course of the semester.

LIST OF EXPERIMENTS:

Perform the experiments lab using MATLAB:

1. To represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine)
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To understand stability test.
5. To understand sampling theorem.
6. To design analog filter (low-pass, band-pass, band-stop).
7. To design digital IIR filters (low-pass, high pass, band-pass, band-stop)
8. To design FIR filter using windows technique.
9. To design a program to compare direct realization values of IIR digital filter.
10. To develop a program for computing parallel realization values of IIR digital filter.
11. To develop a program for computing cascade realization values of IIR digital filter.
12. To develop a program for computing inverse Z-transform of a rational transfer function.

Note: At least eight experiments to be done from the above list.

SEMESTER – VIII

COMPUTER APPLICATIONS TO POWER SYSTEM ANALYSIS LAB EE-8005

Course Code	**EE-8005**	**Credits:2**	**L-0,T-0,P-2**
Name of the Course	**COMPUTER APPLICATIONS TO POWER SYSTEM ANALYSIS LAB**		
Lectures to be delivered.	**26 hours of Lab sessions**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 50**	**Min. Pass Marks: 20**
Laboratory	Continuous Assessment (based on Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%)	**Max Marks: 50**	**Min.Pass Marks: 25**

Instructions for paper setter /Candidates.

Laboratory examination will consist of two parts:
i) Performing a practical examination assigned by the examiner (25 marks).
ii) Viva-voce examination (25 marks).

Viva-voce examination will be related to the practical performed/ projects executed by the candidate related to the paper during the course of the semester.

LIST OF EXPERIMENTS:

APPLICATION OF STANDARD COMPUTER SOFTWARE FOR:

1. Determination of sequence impedances of a transmission line.
2. Fault calculation of power systems.
3. Power flow Studies.
4. Power Flow control.
5. Transient Stability Studies.

ELECTIVE -1
(Select any one)

SEMESTER – VIII

MICROWAVE ENGINEERING **EC-8002**

Course Code	**EC-8002**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**MICROWAVE ENGINEERING**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Wave guides: Introduction, comparison with transmission lines, propagation in TE and TM mode, rectangular wave guide, TEM mode in rectangular wave guide, introduction to circular wave guide, characteristic impedance.

Microwave Components: Directional couplers, tees, hybrid ring, s-parameters, attenuators, cavity resonators, mixers and detectors, matched load, phase shifter, wave meter, Ferrite devices: Isolators, circulators, gyrators.

SECTION-B

Microwave tubes: Limitation of conventional tubes, construction, operation and properties of Klystron amplifier, reflex Klystron, magnetron, Traveling wave tube, cross-field amplifier, backward wave oscillator.

SECTION-C

Microwave Solid State Devices: Varator and step recovery, diodes, Multipliers, Parametric amplifiers, Tunnel diodes, Gunn effect and diodes, MASER, LASER, IMPATT, TRAPATT, PIN, Microwave Antennas.

SECTION-D

Microwave Measurements: Power measurement using calorimeter and bolometers, Measurements of SWR, frequency and wave length, Impedance measurement, Measurement of Noise factor, Microwave bridges.

Propagation of Microwave: Space wave propagation Effect of curvature of Ideal Earth, Various other considerations.

Text Books:-

1. Microwave devices and circuits: Samuel Liao, PHI.

2. Microwave devices and Radar Engg: M.Kulkarni, Umesh

SEMESTER – VIII

NEURAL NETWORKS AND FUZZY LOGIC **EC-8011**

Course Code	**EC-8011**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**NEURAL NETWORKS AND FUZZY LOGIC**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Neural Network characteristics, History of development in Neural Networks Principles, Artificial Neural Net terminology, Model of a neuron, topology, learning types of learning, supervised, unsupervised, re-enforcement learning.

SECTION-B

Basic Hopfield Model, the perception, linear separability, Basic learning laws: Hebb's rule, Delta rule, widrow & Hoff LMS, learning rule, correlation learning rule, instar and outstar learning rules. Unsupervised learning, competitive learning, K-means clustering algorithm, Kohonen's feature maps.

SECTION-C

Radial Basis Function neural networks, basic learning laws in RBF nets, Recurrent networks, recurrent back propagation, Real Time Recurrent learning algorithm.
Introduction to counter propagation network, CMAC network, ART networks.

SECTION-D

Fuzzy logic: Basic concepts of Fuzzy logic, Fuzzy Vs crisp set, Linguistic Variables, membership functions, operations of fuzzy sets, fuzzy IF-THEN rules, variable inference techniques, de-fuzzification techniques, basic fuzzy inference algorithm, Applications of fuzzy system, useful tools supporting design.

Reference books:

1. Fuzzy systems Design Principles, Building Fuzzy IF-THEN Rule Bases By Riza C.Berkin & Trubatch. IEEE Press ISBN 0-7803-1151-5.
2. Yegna narayanam – Artificial Neutral Networks.
3. Bart Kosko- Neural Networks & fuzzy logic.

4. Simon Haykin – Neutral Networks.
5. Ross. T.- Fuzzy Logic.

SEMESTER - VIII

CELLULAR AND SATELLITE COMMUNICATION EC(ID) 8014

Course Code	**EC(ID)8014**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**CELLULAR AND SATELLITE COMMUNICATION**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Mobile Telephone Service, Evolution of cellular Telephone, Fundamental Concepts of Cellular Telephone, Fundamental Concepts of Cellular Telephone, Frequency Reuse, Interference, segmentation & Dualization, Cellular System Topology, Roaming & Handoffs, Cellular Telephone network Components, Cellular Cell processing.

SECTION – B

First Generation Analog Cellular Telephone, Second Generation Analog Cellular Telephone, Personal Comm. Systems, digital Cellular telephone, CDMA Cellular Radio network, Globle Systems for Mobile communication.

SECTION- C

Principle of Satellite Comm., Kepler's law, Geosynchronous Satellite, Antenna look angles, Satellite classifications spacing and Frequency allocation, Satellite antenna Radiation patterns, Footprints, Satellite link models, Parameter & Equations.

SECTION –D

FDM/FM Satellite Systems, Multiple accessing - FDMA,TDMA,CDMA,Channel Capacity Special purpose Comm. Satellites, INTELSAT, VSAT (data broad – band Satellite), MSAT LEOs (lower Earch Orbit Satellite), Defence Satellites.

Reference books:

1. Advanced Electronic Communications Systems: Wayne Tomasi.
2. Electronic communications: Dennis Roddy & John Coolen.

SEMESTER – VIII

COMMUNICATION SYSTEM **EC-8020**

Course Code	**EC-8020**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**COMMUNICATION SYSTEMS**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

PULSE COMMUNICATION: Information in a communication system, coding, noise in an information carrying channel, Types of pulse modulation, Pulse Amplitute modulation (PAM),Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Pulse code Modulation (PCM), Telegraphy (& Telex), Telemetry.

SECTION-B

BROADBAND COMMUNICATION SYSTEMS: Frequency division multiplexing, Time division multiplexing, Short & Medium Haul systems- Coaxial Cables, Fiber Optic Links, Microwave Links, Tropospheric scatter links, Long Haul Systems- Submarine cables, Satellite communications.

SECTION-C

SATELLITE COMMUNICATION: Introduction, Orbits, Station keeping, Orientation of Satellite, Transmission Path, It's losses & noise consideration, Satellite Systems, Saturation flux Density, effective isotropic radiated Power, SPADE, TDMA.

SECTION-D

FIBER OPTIC COMMUNICATION: Introduction, Principle of light transmission in a fiber, Effect of Index profile on Propagation, Modes of propagation, Number of modes via fiber, Single mode propagation, Raleigh scattering losses, Absorption losses, mode coupling losses, bending losses, combined losses, Effects of Dispersion on Pulse Transmission, intermodal dispersion, material dispersion, wave guide dispersion, total dispersion, fiber optic communication system.

BOOKS:

1. Electronics communication systems by Kennedy & Davis, TMH
2. Electron ics Communication by Dennis Roddy & John Coolen.

SEMESTER – VIII

RELIABILITY OF ELECTRONICS COMMUNICATION SYSTEM EC-8021`

Course Code	**EC-8021**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**RELIABILITY OF ELECTRONICS COMMUNICATION SYSTEM**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Basic Definitions, concept and need for reliability, inherent value of reliability in modern system, hazard rate and failure density function, mean time to failure & repair. Relationship between basic variables, analytical form of reliability function. Derivation for the exponential distribution function and Webiull distribution.

SECTION- B

Different type and modes of failures, causes of failure in different systems, systems structures, series , parallel, stand by , K-out-of –n configuration their reliability analysis. Reliability evaluation techniques applicable to general non-series parallel system. Markov processes for repairable & nonrepairable system & their applications in reliability analysis.

SECTION- C

Maintainability, analysis of down time, Repair Time Distribution, Stochastic Point Processes, System Repair Time, Reliability under Preventive Maintenance, State Dependent Systems With Repair Maintenance Requirements.

Availability, concepts & definitions, Exponential Availability model, Systems availability, Inspection & Repair availability model, design trade-off Analysis.

SECTION-D

Data collection & Empirical Methods – Data collection, Empirical methods, static life estimation. Reliability Testing- Product testing, Reliability Life testing, Test time calculations, Burn in testing, Acceptance testing, accelerated life testing, experimental design, Competing failure models.

BOOKS

1. Concepts in Reliability by L.S. Sri Nath.
2. Reliability Engineering by Balaguruswamy.
3. Reliability and Maintainability Engineering by Charles E.Ebeling.

ELECTIVE –II
(Select any one)

SEMESTER – VIII
ELECTIVE -II

ELECTRICAL MACHINE DESIGN **EEE-8002**

Course Code	**EEE-8002**	**Credits:4**	**L-2,T-2,P-0**	
Name of the Course	**ELECTRICAL MACHINE DESIGN**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**			

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

Principles of electrical machine design- General design considerations – specifications of machines – types of enclosures- types of ventilation – hydrogen cooling – heating – short time rating – overload capacity – temperature rise time curve – hot spot rating.
Review of properties of materials used in electrical machines.
Design of power transformers – single phase and three phase transformers – distribution and power transformers- output equation – specific magnetic loading – core design – window area- window space factor – overall dimensions of core. Windings –no. of turns – current density – conductor section – types of coils – insulation electric stress, Cooling of transformers – design of cooling tank and tubes.

SECTION –B

Field flux distribution curve – field form factor – magnetic leakage coefficient – calculation of field ampere turns- air gap mmf- effect of slot and ventilating duct- active iron length – mmf for teeth – real and apparent flux densities - mmf per pole- design of electromagnet.

SECTION –C
Design of DC machines- output equation – specific loading – choice of speed and no of poles – calculation of main dimensions – choice of type of winding – number of slots – number of

conductors per slot-current density – conductor section – slot insulation – length of air gap – design of field winding – excitation voltage – conductor cross section – height of pole – design of interpole – flux density under interpole – calculation of turns of interpole winding.

SECTION –D

Design of synchronous machines – specific loading – output equation – main dimensions – types of winding – number of turns – number of slots and slot design – field design for water wheel and turbo alternators- cooling of alternators. Design of three phase induction motors – main dimensions – stator design – squirrel cage and slip ring types – number of stator and rotor slots – rotor bar current –design of rotor bar-end ring current – design of end ring – design of slip ring rotor winding.
Introduction to computer aided design.

TEXT BOOKS:

1. Sahney A.K, " A Course in Electrical Machine Design", Dhanpat Rai & Sons, Delhi.

REFERENCES

1. M.V.Deshpande: "Design and Testing of Electrical Machines", Wheeler Publishing.
2. R.K.Agarwal: "Principles of Electrical Machine Design", Esskay Publications, Delhi.
3. Ramamoorthy M."Computer 'Aided Design of Electrical Equipment", East –West Press.

NOTE: The question paper will consist of two parts. Part –A is to be compulsory for 40 marks (10 questions of 4 marks each). Part –B is to cover 3 modules for 60 marks, (50% choice, One out of two or tow out of four from each module).

SEMESTER – VIII
ELECTIVE - II

DIRECT ENERGY CONVERSION **EE-8004 D**

Course Code	**EE-8004 D**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**DIRECT ENERGY CONVERSION**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**		

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTRODUCTION: Conventional generation, alternative generation processes, Topper devices, criteria for central power generation.

THERMIONIC GENERATION: The basic thermionic diode generator and its analysis, Cross held devices, Anode and cathode materials, Experimental thermionic generator.

SECTION-B

MHD GENERATION: Principles of MHD generation, electrical conditions, Faraday generator, Hall generator, comparison of generators, choice of generator parameters, other generator configurations.

EXPERIMENTAL MHD GENERATION: Open cycle working, closed cycle operation, Liquid metal systems, alternating current system.

SECTION –C

THERMOELECTRIC GENERATION: Seeback effect, Peltier effect, Thomson effect, EMF relationship, Generator analysis , Material selection, Experimental thermoelectric generation.

SECTION-D

FUEL CELLS: Principles of fuel cells, Thermodynamics of the fuel cell, choice of fuels and operating condition, Polarization and its effect, Redox cell, Overall efficiency, Practical Fuel Cells – various types.

FURTHER CONVERSION PROCESS: Miscellaneous techniques – radiation cell, ferromagnetic generation, ferroelectrics generation, controlled thermo nuclear reactions, Practical devices.

BOOKS

1. Direct Energy Conversion by R.A.Coombe.

SEMESTER – VIII

ELECTIVE - II

SYSTEMS AND OPERATIONS RESEARCH **EE-8004 A**

Course Code	**EE-8004 A**	**Credits:4**	**L-3,T-1,P-0**	
Name of the Course	**SYSTEMS AND OPERATIONS RESEARCH**			
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**			
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**	
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)	**Max. Marks: 50**			

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTRODUCTION: Development, characteristics, necessity and scope of operations research, classification and characteristics of models.

SYSTEMS: Introduction of Systems approach for solving organization problems.

SECTION-B

LINEAR PROGRAMMING: Formulation of problems, Graphical solution, Simplex method, Big M method, two – phase method.

TRANSPORTATION MODEL: Formulation of models, Vogel's approximation method.

SECTION-C

ASSIGNMENT MODELS: Comparison with transportation model solution of problems.

GAME THEORY: Game strategies, stable games, unstable games, solution.

SECTION –D

PERT/CPM: Phases of project management, net work logic, PERT computation, critical path, float, critical path method.

BOOKS

Operations Research by P.K.Gupta & D.S.Hira.

REFERENCE BOOKS:

1. Operations Research: An Introduction by H.A.Taha.
2. Decision Making through Operations Research by R.J.Thieraut.
3. PERT CPM BY J.D.WIEST & F.K.Levy.

SEMESTER – VIII
ELECTIVE - II

OPTIMIZATION TECHNIQUES **EE-8004 B**

Course Code	**EE-8004 B**	**Credits:4**	**L-3,T-1,P-0**
Name of the Course	**OPTIMIZATION TECHNIQUES**		
Lectures to be delivered.	**52 (1 Hr Each) (L=39,T=13 for each semester)**		
Semester End Examination	**Max.Time:3 hrs.**	**Max Marks: 100**	**Min. Pass Marks: 40**
Continuous Assessment (based on sessional tests (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)		**Max. Marks: 50**	

Instructions:

1. **For Paper Setters**: The question paper will consist of five section A, B,C, D & E. Section E will be compulsory, it will consist of a single question with 10-20 subparts of short answer type, which will cover the entire syllabus and will carry 20% of the total marks of the semester end examination for the course. Section A,B,C & D will have two questions from the respective sections of the syllabus and each question will carry 20% of the total marks of the semester end examination for the course.
2. **For candidates**: Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

SECTION –A

INTRODUCTION: Engineering applications of optimization, Statement of an optimization problem, classification of optimization problems, Optimization.

CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization, Multivariable optimization with no constraints, Multivariable optimization with equality constraints, Multivariable optimization with inequality constraints.

SECTION-B

LINEAR PROGRAMMING: Simplex method, Revised Simplex method, Sensitivity Analysis, Linear complementary and fractional programming problems.

SECTION- C

NON-LINEAR PROGRAMMING: Unimodel function, elimination methods, unrestricted search, Dichotomous search, Interpolation methods, Quadratic interpolation methods, Direct root method.

SECTION- D

DYNAMIC PROGRAMMING: Multistage decision processes, concept of sub-optimization and principle of optimality, computational procedure in dynamic programming, Illustrative examples, conversion of a Final value problem into an Initial value problem, Linear Programming as a case of Dynamic programming.

BOOKS

1. Optimization theory and applications by S.S.Rao (Second Edition) – Wiley Eastern Ltd, New Delhi.