Electronics & Electronics Engineering Syllabus

West Bengal University of Technology

COURSE STRUCTURE FOR B.TECH IN ELECTRICAL& ELECTRONICS ENGINEERING

3RD SEMESTER

CODE	THEORY	Contacts periods Per week			Total	Credits
		L	T	P		
A. THEORY:						
EE301	Circuit Theory & Networks	3	1	-	4	4
EE302	Electrical & Electronic Measurement	3	1	-	4	4
CS302	Data Structure & Algorithms	3	1	-	4	4
MS301	Materials Science	3	0	-	3	3
M 302	Mathematics	3	1	-	4	4
CS312	Numerical Methods & Programming	3	0	-	3	3
	TOTAL OF THEORY				22	22
B. PRACTICAL						
EE 391	Circuits & Network Lab	0	0	3	3	2
EE 392	Electrical & Electronic Measurement Lab	0	0	3	3	2
CS 392	Data Structure Lab	0	0	3	3	2
CS382	Numerical Methods & Programming Lab	0	0	3	3	2
	TOTAL OF PRACTICAL				12	8
	TOTAL of Semester :				34	30

FOURTH SEMESTER

A.THEORY:

	Code	Subjects	Contacts (periods/week)				Credit points
			L	T	P	Total	
	EC 401	Analog Electronic Circuits	3	0	0	3	3
	EC 402	Digital Electronics & Integrated Circuits	3	1	0	4	4
	EI 402	Electronic Measurements & Instrumentation	3	0	0	3	3
	CS 404	Computer Organization & Architecture	3	0	0	3	3
	EI 401	Transducer & Sensors	3	0	0	3	3
		Total of Theory				16	16

B.PRACTICAL:

			Contact Periods Per Week			Total	Credit
			L	T	P		
	EC 491	Analog Electronic Circuits Lab.	0	0	3	3	2
	EC 492	Digital Electronics & Integrated Circuits Lab.	0	0	3	3	2
	EI 492	Electronic Measurements & Instrumentation Lab	0	0	3	3	2

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	EI 491	Transducer & Sensors Lab	0	0	3	3	2
	Total of Practical					**12**	**8**
	Total of 4th Semester -					**28**	**24**

C. SESSIONAL:

HU 481	Technical Report writing & / Language Practice Lab	0	0	0	3	2
	TOTAL OF SESSIONAL				3	2
	TOTAL :				**31**	**26**

FIFTH SEMESTER

OF

ELECTRICAL AND ELECTRONICS ENGINEERING

A. THEORY

SL NO	CODE	THEORY	CONTACT PERIODS PER WEEK			TOTAL	CREDITS
			L	**T**	**P**		
1	EEE 501	ELECTRICAL MACHINES-I	3	1	0	4	4
2	EE 504	POWER ELECTRONICS	3	0	0	3	3
3	EE 503	CONTROL SYSTEM	3	1	0	4	4
4	EEE 502	ELECTROMAGNETIC THEORY	3	1	0	4	4
5	EI 502	MICROPROCESSOR & MICRO CONTROLLER	3	0	0	3	3
		TOTAL THEORY				18	18

B. PRACTICAL

SL NO	CODE	THEORY	CONTACT PERIODS PER WEEK			TOTAL	CREDITS
			L	**T**	**P**		
1	EEE 591	ELECTRICAL MACHINES-I LAB	0	0	3	3	2
2	EE 594	POWER ELECTRONICS LAB	0	0	3	3	2
3	EE 593	CONTROL SYSTEM	0	0	3	3	2
4	EI 592	MICROPROCESSOR & MICRO CONTROLLER	0	0	3	3	2
		TOTAL PRACTICAL				12	8

TOTAL SESSIONS :   30   26

SIXTH SEMESTER

A. THEORY:

CODE	THEORY	Contacts periods Per week			Total	Credit
		L	**T**	**P**		
EEE 601	ELECTRICAL MACHINES – II	3	1	0	4	4
EEE 604	ELECTRIC DRIVES	3	1	0	4	4
EEE 603	POWER SYSTEM – I	3	1	0	4	4
ME 602	HEAT POWER ENGG	3	1	0	4	4
EEE 605	ACTIVE & PASSIVE NETWORK SYNTHESIS	3	0	0	3	3
EEE 606/1/2	ELECTIVE – I	3	0	0	3	3
	TOTAL THEORY				22	22

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B. PRACTICAL :

CODE	PRACTICAL	Contacts periods Per week			Total	Credit
		L	T	P		
EEE 691	ELECTRICAL MACHINES – II LAB	0	0	3	3	2
EEE 694	ELECTRIC DRIVES LAB	0	0	3	3	2
EEE 693	POWER SYSTEM – I LAB	0	0	3	3	2
ME 692	HEAT POWER ENGG LAB	0	0	3	3	2
	TOTAL PRACTICAL				12	8

	TOTAL SESSIONS:				34	30

**Structure & Academic Curricula for B. Tech in
Electrical
&
Electronics Engineering**

SEVENTH SEMESTER

A. **THEORY**

Sl. No	Code	Theory	Contact Periods / Week			Total	Credits
			L	T	P		
1.	EEE-701	Power System - II	3	0	0	3	3
2.	IT-711	Multimedia Systems	3	0	0	3	3
3.	EEE-702	Electrical Machine Design	3	0	0	3	3
4.	EEE-703	Digital Signal Processing	3	0	0	3	3
5.	EEE-704	Elective-II	3	0	0	3	3
		TOTAL THEORY				15	15

B. **PRACTICAL**

Sl. No	Code	Theory	Contact Periods / Week			Total	Credits
			L	T	P		
1.	EEE-791	Power System – II Lab	0	0	3	3	2
2.	EEE-792	Electrical Machine Design Lab	0	0	3	3	2
3.	IT-781	Multimedia Lab	0	0	3	3	2
		TOTAL PRACTICAL				9	6

C. **SESSIONAL**

Sl. No.	Code	Theory	Contact Periods / Week			Total	Credits
1.	EEE-781	Assigned Project	0	0	0	0	4
2.	EEE-782	Seminar on Assigned / Selected Topics	0	0	3	3	2
		TOTAL SESSIONAL				3	6

		TOTAL OF SEMESTER				27	27

Elective-II
a. HVDC Transmission
b. Power Generation Economics
c. Utilization of Electric Power
d. Illumination Technology

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D. THEORY

Sl. No	Code	Theory	Contact Periods / Week			Total	Credits
			L	T	P		
1.	HU-801	Values and Ethics in Profession	3	0	0	3	3
2.	HU-802	Industrial Management	3	0	0	3	3
3.	EEE-801	Financial Management & Accounts	3	0	0	3	3
4.	EEE-802	Elective-III	3	0	0	3	3
		TOTAL THEORY	12			12	12

E. SESSIONAL

Sl. No	Code	Theory	Contact Periods / Week			Total	Credits
1.	EE-881	Personality Development			3	3	2
2.	EE-882	Comprehensive Viva-Voce					4
3.	EE-893	Assigned Project	-	-	12	12	8
4.							
5.							
		TOTAL SESSIONAL			15	15	14

		TOTAL OF SEMESTER				27	26

Elective-III

a.	Microprocessor Based Systems-EEE-802(a)
b.	Optimization Techniques-EE-802(b)
c.	Advanced Numerical Computation-EE-802©
d.	Energy Audit & Conservation-EE-802(d)
e.	Optimal Control Systems-EE-802(e)
f.	Communication Engineering-EC-802(f)
g.	Remote Control & Telemetry-EI-802(g)
h.	Computer Communication-EC-802(h)
i.	AI and Neural Networks-CS-802(i)
j.	Project Management & Operation Research-M-802(j)

Syllabus of B.Tech. in Electrical Engineering

CIRCUIT THEORY & NETWORKS
Code: EE 301
Contact: 3L + IT
Credit: 4

Different types of systems & networks: continuous & Discrete, Fixed and Time varying, Linear and Non-linear, Lumped and distributed, Passive & Active Networks & Systems

Laplace transform of impulse and sinusoidal steps waveforms for RL, RC, LC and RLC Circuits. Transient analysis of different electrical circuits with and without initial conditions, Fourier Series and Fourier Transform

Network theorems and their applications in circuit analysis, Formulation of network equations, Source transformations, Loop variable analysis and node variable analysis

Graph of network, concept of tree branch, tree link. Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials

Electronics & Electronics Engineering Syllabus

Two port networks, Open circuit Impedance and Short circuit Admittance parameters, Transmission parameters, hybrid parameters, and their inter-relations
Indefinite admittance matrix- their applications to the analysis of active network
Active filter analysis and synthesis using operational amplifier

SPICE: How SPICE works. Model statement, models for passive and active device, D.C. circuits analysis, small signal analysis, capacitors and inductors in D.C. Circuits, steady state and transient, plotting and printing, input and output Impedance, D.C. sensitivity analysis, harmonic decomposition (Fourier Series), Harmonic re-composition, voltage controlled components

Text books **:**

1. Sudhakar:Circuits & Networks:Analysis & Synthesis 2/e TMH
2. Engineering circuit analysis with PSPICE and probe-Roger,MH
3. Engg Circuit Analysis,: Hayt 6/e Tata Mcgraw-Hill
4. Valkenburg M. E. Van, "Network Analysis", Prentice Hall
5. A. Chakravarty: Networks, Filters & Transmission Lines
6. D.Chattopadhyay and P.C.Rakshit: Electrical Circuits
7. A.V. Oppenheimer and A.S.Wilsky: Signals & Systems, PHI
8. R.V.Jalgaonkar.: Network Analysis & Synthasis.
9. Sivanandam: Electric Circuits Analysis
10. Gupta: Circuit Analysis with Computer Application, New Age International
11. Mann: Introductory A.C.Circuit Theory, Universities Press
12. Aatre: Network Theory & Filter Design, New Age International
13. Adby: Applied Circuit Theory, New Age International
14. Wadhwa: Network Analysis & Synthesis, New Age International
15. Roychowdhury: Linear Integrated Circuits, New Age International
16. Roy Choudhury D., "Networks and Systems", New Age International Publishers.
17. V.K. Chandna, A Text Book of Network Theory & Circuit Analysis, Cyber Tech

References **:**

Reza F. M. and Seely S., "Modern Network Analysis", Mc.Graw Hill Book Company
Kuo F. F., "Network Analysis & Synthesis", John Wiley & Sons.

ELECTRICAL AND ELECTRONIC MEASUREMENT
Code : EE 302
Contacts : 3L + 1T
Credits :4

General features – Construction and principle of operation of moving coil, moving iron, Dynamometer, Thermal and Rectifier type deflecting instruments. Deflecting, controlling and damping torques, extension of instrument ranges using shunts, multipliers and instrument transformers. Measurement of low, medium and high resistances, Kelvins double bridge, multimeters, megger, localization of cable faults.

D.C. and A.C. potentiometers, Measurement of high voltage, Electrostatic instruments, measurement of inductances, capacitance and frequency by A.C. Bridges.

Measurement of power in polyphase circuits, various wattmeter connections. A.C. and D.C. energy meters.

C.R.O. construction & principle measurement of voltage, current, frequency and phase by oscilloscope.

Electronic voltmeters – analog and digital. Digital multimeters, Audio oscillators, signal generators and frequency counter.

Text Books:

1. Golding E.W. & Wides F.C. : Electrical Measuring Instruments & Measurements ; Wheeler
2. Electronic Instrumentation – H.S. Kalsi, ISTE/EXCEL BOOKS
3. Singh:Industrial Instrumentation &control 2/e Tata Mcgraw-Hill,NewDel
4. Sawhney A K : A course in Electrical & Electronic Measurements & Instruments, Dhanpat rai
5. Kalsi:Electronic Instrumentation TMH
6. Heltrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
7. Patranabis D: Sensors & Transducers, Wheeler 96
8. R.V.Jalgaonkar.: Electronics Instrumentation.
9. Sutko: Industrial Instrumentations
10. Bolton W: Instrumentation & Process Measurement, Universities Press
11. Reissland: Electrical Measurement, New Age International

DATA STRUCTURES AND ALGORITHMS
Code: CS 302
Contact: 3L + IT
Credit: 4

Overview of C language
Time and Space analysis of Algorithms - Order Notations.

Linear Data Structures - Sequential representations - Arrays and Lists, Stacks, Queues and Dequeues, strings, Application.

Linear Data Structures, Link Representation - Linear linked lists, Circularly linked lists. Doubly linked lists, application.

Recursion - Design of recursive algorithms, Tail Recursion, When not to use recursion, Removal of recursion.

Non-linear Data Structure: Trees - Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs - Representations, Breadth-first and Depth-first Search.

Hashing - Hashing Functions, collision Resolution Techniques.

Sorting and Searching Algorithms, Bubble sort, Selection Sort, Insertion Sort, Quicksort, Merge Sort, Heapsort and Radix Sort.

File Structures - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.

Text books:

1. Data Structures and Algorithms – O.G. Kakde and U.A. Deshpande, ISTE/EXCEL BOOKS

2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms",   Addison Wesley
3. Drozdek A –Data Structures and Algorithms
4. Pujari A.K. – Data Mining & Techniques, Universities Press
5. Ajay Agarwal- Data Structure Through C, Cyber Tech

References :

1.Heileman :data structures algorithms &OOP Tata McGraw Hill
2. Data Structures Using C – M.Radhakrishnan and V.Srinivasan, ISTE/EXCEL BOOKS
3. Weiss Mark Allen, "Algorithms, Data Structures, and Problem Solving with C++", Addison Wesley.
4. Horowitz Ellis & Sartaj Sahni, "Fundamentals of Data Structures", Galgotria Pub.
5.Tanenbaum A. S. , "Data Structures using 'C' "

MATERIAL SCIENCE
Code : MS 301
Contacts : 3L
Credits :3

Introduction : Classification of materials; Structure-property Relations; Metals & Alloys, Ceramics, Polymers, Composites and Semiconductors. Atomic Structure & Interatomic Bonding ; Fundamentals of Atomic Structure and Chemical Bonding; Atomic Bonding in Solids.

Phase Diagrams : Phase Rules; Single component and Binary Phase diagrams; The Level Rule; Hume-Rothery rules of alloying.

Diffusion in solids : Fick's Laws of Diffusion; The Atomic Model of Diffusion

Phase Transformations: Nucleation and Growth , Recovery, Re crystallization and Grain Growth.

Environmental Degradation of materials : Oxidation and Corrosion; Thermal and Photo Degradation ; Chemical Degradation ; Radiation Damage.

Structure of solids : Crystalline and Non-crystalline states; Crystallographic directions and phases; Determination of crystal structures.

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Defects and imperfections in solids : Point, Line and Planer defects; Interfacial defects and volume defects; impurities in solids.

Elastic, Plastic and Viscoelastic Behaviour of materials: Stress-strain relationship; relaxation and creep; strengthening mechanism and fracture.

Thermal properties of materials : Heat capacity; Thermal expansion and thermal conductivity.

Electrical properties : Electronic and Ionic conduction; Energy Band structures in solids ; Electron Mobility ; Temperature variation of conductivity.

Dielectric behaviour : Capacitance ; Types of polarization ; Frequency dependence of dielectric constant; Ferroelectricity and Piezoelectricity in materials.

Magnetic properties : Diamagnetic; Ferromagnetic, antiferromagnetic and Ferrimagnetic behaviour of materials; soft and hard magnetic materials; superconductivity.

Optimal properties : Light interaction with solids; Absorption, Transmission and Reflection; Luminescence; Photoconductivity ; Lasers.

Materials selection: Material properties and Engineering Design parameters; General effects of processing on parameters; selection of structural; Electronic and Magnetic Materials – case studies.

Text Books:

1.   L.H. Van Vlack - Elements of Materials Science & Engineering – Addison-Wesley Publishing Company, New York.

2.   V Raghavan – Materials Science & Engineering. – Prentice Hall of India Pvt. Ltd., New Delhi.

3.   Murthy & Jena: Structure and properties of Engineering Materials ,TMH New Delhi

4.   W D Callister, Jr. – Materials Science & Engineering – An Introduction – John Willey & Sons, Inc, New York.

5.   J F Shackelford – Introduction to Materials Science for Engineers – Maxwell Macmilan International Editions, Singapore.

6.   C M Srivastava & C Srinivasan – Science of Engineering materials – New Age International (P) Ltd. Publishers, New Delhi.

Reference Books:

7.   J W Mayer and S S Lau – Electronic Materials Science - Maxwell Macmilan International Editions, Singapore

8. R E Hummel – Electronic Properties of Materials – Narosa Publishing House, New Delhi.

MATHEMATICS
Code: **M 302**
Contacts: 3L + 1T
Credits: 4

Fourier Series:
Introduction: Euler's formula; Problems on general Fourier Series; Conditions for Fourier Expansion; Fourier Expansions of Discontinuous Functions; Even and Odd functions; Change of interval; Half range series; Typical Waveforms (Square, Saw-toothed, Triangular, Half Wave rectifier, Full Wave rectifier); Parseval's Identity (statement only); Fourier Transform (FT) and its properties; Inverse Fourier Transform (statement only); Fourier transform of derivative (statement only); Convolution (statement only); Application of Fourier Transform in solving partial differential equations — Laplace's Equation (2D only), Heat Conduction Equation (1D only) and Wave Equation (1D only). *12L*

Calculus of Complex Variable:
Functions; Limits and Continuity; Analytic Functions; Cauchy Riemann Conditions; Analytic Continuation; Complex Integration and Cauchy's Theorem; Cauchy's Integral Formula; Taylor's and Laurent Series; Zeros of an Analytic Function; Poles; Essential Singularities; Residue Theorem (statement only) and it's application to evaluation of integral; Introduction to Conformal Mapping; Simple problems. *14L*

Probability and Statistics:

Mean, Median, Mode and Standard Deviation; Samples Space; Definition of Probability; Conditional Probability; General *10L*
Multiplication Theorem; Independent Events; Bayes' Theorem; Random Variable; Discrete and Continuous Probability
Distributions - Probability mass function; Probability density function; Distribution Function; Expectation; Variance;
Probability Distribution—Binomial, Poisson and Normal. Correlation and Regression; Method of Least Squares; Linear
Curve Fitting.

Graph Theory:
Graphs; Digraphs; Isomorphism; Walk; Path; Circuit; Shortest Path: Dijkstra's Algorithm; Tree; Properties of Tree; Binary *12L*
Tree; Fundamental Circuit; Minimal Spanning Tree: Kruskal's Algorithm; Prim's Algorithm. Cut Set; Fundamental Cut Set
and Cut Vertices; Matrix Representation of Graphs (Adjacency and Incidence Matrices); Network; Flow Augmenting Path;
Ford-Fulkerson Algorithm for Maximum Flow; Max Flow – Min Cut Theorem (statement only).

Total *48L*

Text Books:

1. Rathor, Choudhari,: Descrete Structure And Graph Theory.
2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics - Sultan Chand & Sons.
3. Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill Book. Co.
4. Spiegel M R: Theory and Problems of Probability and Statistics (Schaum's Outline Series) - McGraw Hill Book Co.
5. Goon A.M., Gupta M K and Dasgupta B: Fundamental of Statistics - The World Press Pvt. Ltd.
6. Spiegel M R: Theory and Problems of Complex Variables (Schaum's Outline Series) - McGraw Hill Book Co.
7. Bronson R: Differential Equations (Schaum's Outline Series) - McGraw Hill Book Co.
8. Ross S L: Differential Equations - John Willey & Sons.
9. Sneddon I. N.: Elements of Partial Differential Equations - McGraw Hill Book Co.
10. West D.B.: Introduction to Graph Theory - Prentice Hall
11. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.
12. Grewal B S: Higher Engineering Mathematics (thirtyfifth edn) - Khanna Pub.
13. Kreyzig E: Advanced Engineering Mathematics - John Wiley and Sons.
14. Jana- Undergradute Mathematics
15. Lakshminarayan- Engineering Math 1.2.3
16. Gupta- Mathematical Physics (Vikas)
17. Singh- Modern Algebra
18. Rao B: Differential Equations with Applications & Programs, Universities Press
19. Murray: Introductory Courses in Differential Equations, Universities Press
20. Delampady, M: Probability & Statistics, Universities Press
21. Prasad: Partial Differential Equations, New Age International
22. Chowdhury: Elements of Complex Analysis, New Age International
23. Bhat: Modern Probability Theory, New Age International
24. Dutta: A Textbook of Engineering Mathematics Vol.1 & 2, New Age International
25. Sarveswarao: Engineering Mathematics, Universities Press
26. Dhami: Differential Calculus, New Age International

NUMERICAL METHODS AND PROGRAMMING
Code : CS 312
Contacts : 3L
Credits :3

Approximation in numerical computation, Truncation and rounding errors;
Interpolation: Lagrange's Interpolation, Newton forward & backward differences Interpolation, Newton divided difference;
Numerical Integration: Trapezoidal, Rule, Simson's 1/3 Rule, Weddle' Rule;
Numerical Solution of a system of linear equation
Gauss elimination method, Matrix Inversion, LU Factorization method, Gauss Jacobi method, Gauss Seidel method;
Algebraic Equation: Bisection method, Secant method, Regular-Falsi method, Newton-Raphson method;
Numerical solution of ordinary differential equation: Taylor's series method, Euler's method, Runge-kutta method, and Predictor-
Corrector method;
C Language Overview: Loop, recursion, function, array, pointers, structures, various types of file access methods: Sequential, Indexed
Sequential, Random;
Various types of files in C and various types file handling statements in C
Implementation above Numerical & Statistical Problems in C Language;

Text Books:

1. Numerical Analysis & Algorithms, Pradeep Niyogi, TMH, 1st ed.
2. Numerical Mathematical Analysis by J.B.Scarborough
3. C Language and Numerical Methods by C.Xavier
4. Introductory Numerical Analysis by Dutta & Jana
5. Balagurusamy: Numerical Methods
6. Discrete Mathematical Structure – Rakesh Dube and Vijay Vir, EXCEL BOOKS
7. Numerical Methods (Problems and Solution) by Jain, Iyengar , & Jain
8. Numerical Methods In Computer Applications – P.U.Wayse. EPH
9. Computer Orinted Numerical Method- N. Dutta vikash
10. Numerical Methods with Programs in Basic Fortran Pascal & C++ - S.B.Rao, Universities Press
11. Computer Programming & Numerical Analysis – N.Dutta, Universities Press
12. Numerical Methods for Engineers – Gupta, New Age International
13. Numerical Solutions of Differential Equations – Jain M.K.,New Age International
14. Numerical Methods for Scientific & Engg Computation – Jain M.K.,New Age International
15. Numerical Analysis – Rao G.S.,New Age International
16. Discrete Mathematical Structures – Rao G.S., New Age International
17. Foundations of Discrete Mathematics – Joshi K.D., New Age International
18. Applied Discrete Structures – Joshi, New Age International
19. Groups, Rings & Modules with Applications – Adhikari, M.R.,Universities Press

CIRCUITS & NETWORK LAB
Code: EE 391
Contact: 3P
Credit: 2

List of Experiments:

1. Transient response in R-L and R-C Network: Simulation/hardware

2. Transient response in R-L-C Series & Parallel circuits   Network: Simulation/hardware

3. Determination of Impedance (Z) and Admittance(Y) parameters of two port network

4. Frequency response of LP and HP filters

5. Frequency response of BP and BR filters

6. Generation of Periodic, Exponential, Sinusoidal, Damped sinusoidal, Step, Impulse, Ramp signals using MATLAB in both discrete and analog form

7. Evaluation of convolution integral, Discrete Fourier transform for periodic & non-periodic signals and simulation of difference equations using MATLAB

8. Representation of poles and zeros in z-plane, determination of partial fraction expansion in z-domain and cascade connection of second order system using MATLAB

9. Determination of Laplace transform and inverse Laplace transformation using MATLAB

10. Spectrum analysis of different signals

Note: An Institution/College may opt for some other software or hardware simulation wherever possible in place of MATLAB

ELECTRICAL AND ELECTRONIC MEASUREMENT LAB
Code: EE 392
Contact: 3P
Credit: 2
List of Experiments:

1. Instrument workshop- observe the construction of PMMC, Dynamometer, Electro thermal and Rectifier type instrument, Oscilloscope and digital multimeter

2. Calibrate moving iron and electrodynamometer type ammeter/volmeter by potentiometer

3. Calibrate dynamometer type Wattmeter by potentiometer

4. Calibrate A.C. energy meter

5. Measure the resistivity of material using Kelvin Double Bridge

6. Measurement of Power using Instrument transformer

7. Measurement of Power in Polyphase circuits

8. Measurement of Frequency by Wien Bridge using Oscilloscope

9. Measurement of Inductance by Anderson Bridge

10. Measurement of Capacitance by De Sauty Bridge

DATA STRUCTURE LAB
Code: CS 392
Contact: 3P
Credit: 2

Experiments should include but not limited to :
Implementation of array operations
Stacks and Queues : adding, deleting elements Circular Queue : Adding & deleting elements Merging Problem : Evaluation of expressions operations on Multiple stacks & queues :
Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists:
Polynomial addition, Polynomial multiplication
Sparse Matrices: Multiplication, addition.
Recursive and Non-recursive traversal of Trees
Threaded binary tree traversal. AVL tree implementation.
Application of Trees, Application of sorting and searching algorithms
Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

NUMERICAL METHODS & PROGRAMMING LAB
Code: CS 382
Contact: 3P
Credit: 2

1. Assignments on Interpolation: Newton forward & backward, Lagrange

2. Assignments on Numerical Integration: Trapezoidal Rule, Simson's 1/3 Rule, Weddle's Rule

3. Assignments on Numerical solution of a system of linear equation: Gauss elimination, Gauss Jacobi, Matrix Inversion, Gauss Seidal

4. Assignments on Algebric Equation: Bisection, Secant, Regular-falsi, Newton Raphson

5. Assignments on Ordinary Differential Equation: Taylor Series, Euler's method, Runga-Kutta

Assignments on Statistical Problem: Mean, Median, Mode, Standard deviation (for simple & frequency type data), Correlation & Regression

COURSE STRUCTURE IN ELECTRICAL & ELECTRONICS ENGINEERING (EEE)
(For one batch only admitted in Siliguri Institute of Technology(SIT) , academic session 2001-2002)

FOURTH SEMESTER

ELECTRONICS & INSTRUMENTATION ENGINEERING

ANALOG ELECTRONIC CIRCUITS
Code : EC 401
Contacts : 3L
Credits :3

Electronics & Electronics Engineering Syllabus

Transistor Biasing and Stability: Self Bias-CE, CC, Compensation techniques. Voltage, current, transresistance & transconductance amplifier. High frequency model of transistor.

Power amplifiers – Class A, B, AB, C, Tuned amplifier.

Different stages of Operational Amplifier: Differential Amplifier, Constant current source (current mirror etc.), level shifter, Ideal and practical OpAmp. Comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Precision Rectifier

Multivibrator – Monostable, Bistable, Astable.
Timer. Monostable and astable operation using 555 timer.

Linear voltage regulator : series and shunt.
Switched mode power supply.

Function generator, wave shapers.
V-I, I-V, V-F & F-V converters. VCO, PLL lock-in amplifier.

Text Book:
1. Millman & Halkias – Integrated El;ectronics, Tata McGraw Hill.
2. Franco—Design with Operational Amplifiers & Analog Integrated Circuits , 3/e,TMH
3. Schilling & Belone—Electronic Circuit:Discrete & Integrated , 3/e ,TMH
4. Gayakwad R.A -- OpAmps and Linear IC's, PHI
5. Coughlin and Drisscol – Operational Amplifier and Linear Integrated Circuits – Pearson Education Asia.

Reference:

1. Malvino—Electronic Principles , 6/e ,TMH
2. Millman & Taub- Pulse, Digital & switching waveforms- TMH
3. Horowitz & Hill- The Art of Electronics; Cambridge University Press.
4. Hayes & Horowitz- Student Manual for The Analog Electronics; Cambridge University Press.
5. Boyle'stead & Nashelsky: Electronic Devices & Circuit theory, PHI.
6. Millman & Halkias: Basic Electronic Principles; TMH.
7. Tobey & Grame – Operational Amplifier: Design and Applications, Mc Graw Hill.
8. Tushar Jadhab – Linear Integrated Circuits, Everest Publishing House.

DIGITAL ELECTRONICS & INTEGRATED CIRCUITS
Code : EC 402
Contacts : 3L + 1T
Credits :4

Data and number systems, Binary representation, Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, EBDIC, Gray, Signed binary number representation with 1's and 2's complement methods, Binary arithmetic.

Boolean algebra, Venn diagram, logic gates and circuits, Minimization of logic expressions by algebraic method, K-map method and Quine Mc Clauskey method
Combinational circuits- adder, subtractor, encoder, decoder, comparator, multiplexer, de-multiplexer, parity generator, etc

Design of combinational circuits-Programming logic devices and gate arrays.

Sequential Circuits- Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology.
Different types of A/D and D/A conversion techniques.
Different Logic families- TTL, ECL, MOS and CMOS, their operation and specifications.
Memory Systems: RAM, ROM, EPROM,EEROM

Textbooks:
1. Jain—Modern Digital Electronics, 2/e ,TMH
2. Leach & Malvino—Digital Principles & Application, 5/e, TMH
3. Digital Logic Design- Morries Mano, PHI.

Reference:
1. Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.
2. Givone—Digital Principles & Design, TMH
3. Digital Technology- Virendra Kumar, New Age.
4. Digital Circuit & Design- S.Aligahanan, S.Aribazhagan, Bikas Publishing House.
5. Fundamentals of Digital Electronics & Microprocessor- Anokh Singh, A.K. Chhabra, S.Chand.

6. Introduction to Digital Computer Design 4th Ed.- V.Rajaraman & T. Radhakrishnan, P.H.I.

ELECTRONIC MEASUREMENT AND INSTRUMENTATION
EI 402
Contacts: 3L
Credits: 4

Measurement – basic concept and block diagrams of instrumentation schemes. Static & dynamic characteristics –accuracy, precision, fidelity, speed of response, dynamic calibrations.
Errors in measurement-classification of errors e.g. equipment error, interference error etc. Data quality. Statistical analysis –mean mode, median, measures of dispersions. Probable error-distribution functions and tables. Confidence level, significance test. Introduction to reliability. Units and standards of physical quantities –documentation standards. Introduction to OPAMPS and detail circuits.
Instrumentation amplifiers: different configurations. Instrumentation Opamps. Function Generators, pulse generators, noise generators, frequency synthesisers. Log and antilog amplifiers. Precision rectifiers. Peak detectors. Sample and hold circuits. ADC and DAC's. Digital Voltmeters (DVM). Multimeters, counters A.C. millivoltmeters. Wave and spectrum analysers. Q-meters.
Measurement of high frequencies RF and VHF

Text:
>1.Jain—Digital Electronics, 2/e,TMH
>2.Kalsi—Electronic Instrumentation , TMH
>3.Malvino & Leach – Digital Principles & Application , 5/e,TMH
>4.Helric A.D & Cooper W.D—Modern Electronic Instrumentation & Measuring   Instruments, Wheeler Pub.
>5.Dhir S.M—Applied Electronics & Instrumentation, TMH

Reference:

1. Taub & Schilling – Digital Integrated Electronics,TMH
2. Givone—Digital Principles & Design,TMH
3. Shawney A.K—Acourse in Electrical & Electronic Measurements, Dhanpat Rai & Sons.
4. Bowens – Digital Instrumentation , TMH
5. Jones—Instrumentation , Measurement & Feedback, TMH

Computer Organisation & Architecture
Code: CS 404
Contacts: 3L
Credits: 3

Concepts & Terminology : Digital computer concepts; Von-Neumann concept ; Hardware & Software and their nature ; structure & functions of a computer system , Role of operating system.

Memory Unit : Memory classification , characteristics ; Organization of RAM , address decoding ROM/PROM/EEPROM ; Magnetic memories , recording formats & methods , Disk & tape units; Concept of memory map , memory hierarchy , Associative memory organization ; Cache introduction , techniques to reduce cache misses , concept of virtual memory & paging.

CPU Design: The ALU – ALU organization , Integer representation , 1s and 2s complement arithmetic ; Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address; Multiplication of signed binary numbers-Booth's algorithm ; Divide algorithms- Restoring & Non-Restoring ; Floating point number arithmetic; Overflow detection , status flags.

Instruction Set Architecture- Choice of instruction set ; Instruction word formats ; Addressing modes.

Control Design – Timing diagrams; T-States , Controlling arithmetic & logic instruction , control structures ; Hardwired & Micro programmed, CISC & RISC characteristics.

Pipelining-general concept , speed up , instruction & arithmetic pipeline; Examples of some pipeline in modern processors , pipeline hazards; Flynn's classification –SISD ,SIMD , MISD , MIMD architectures-Vector and Array processors & their comparison , Concept of Multiprocessor; Centralized & distributed architectures.

Input/output Organization : Introduction to Bus architecture , effect of bus widths , Programmed & Interrupt I/O , DMA.

Text:
>1.Hayes-- Computer Architecture & Organization,3/e ,MH

2.Carter—Computer Architecture (Schaum Series), TMH
3.Mano M.M—"Computer System Architecture"
4.Chaudhury P. Pal—" Computer Organization & Design" , PHI

Reference:
1.Hamacher—Computer Organization, 5/e, MH
2.Stallings W—" Computer Organization & Architecture" , MH

TRANSDUCERS & SENSORS
EI 401
Contacts: 3L
Credits: 3

Transducers-classification. Resistance types ; potentiometers, strain gauge etc. and their applications. Inductance type LVDT, variable reluctance transducers-principle and applications. Capacitance type; dielectric, capacitance bridge & microphones. Transducers for velocity, acceleration, force and torque. Vibration and piezo-electric transducers. Noise introduced by transducers and their reduction.
IR and UV detectors, ionisation chambers. Radiation pyrometers. Ultrasonic devices, magnetostrictive devices. Photo-detectors, photo-multipliers. LDR, LED's

Books :
1.   Doeblin E.O. - Measurement System : Application & Design , MGH Tokyo
2.   Bentley J.P.- Principle of Measurement System, Longman Scientific & Technical, Singapur, 3rd Edn. 1995.
3.   Patranabis D -Sensors & Transducers , Wheeler, 1996.
4.   Neubert HKP -Instrument Transducers – An introduction to their performance & design , Clarendon Press, 2nd End., 1975.
5.   Murthy DVS – Transducers & Instrumentation, PHI, ND, 1995.
.
6.   Jone B.E.- Instrumentation, Measurement and Feedback ,TMH, 1983.
7.   Dhiv S M- Applied Electronics & Instrumentation ,

EC 491
ANALOG ELECTRONIC CIRCUITS LAB
Contacts: 3P
Credits: 2

1.   Introduction: Study of characteristics curves of B.J.T & F.E.T .
2.   Construction of a two-stage R-C coupled amplifier & study of it's gain & Bandwidth.
3.   Study of class A & class B power amplifiers.
4.   Study of class C & Push-Pull amplifiers.
5.   Realization of current mirror & level shifter circuit using Operational Amplifiers.
6.   Study of timer circuit using NE555 & configuration for monostable & astable multivibrator.
7.   Construction & study of Bistable multivibrator using NE555.
8.   Study of Switched Mode Power Supply & construction of a linear voltage regulator using regulator IC chip.
9.   Construction of a simple function generator using IC.
10.   Realization of a V-to-I & I-to-V converter using Op-Amps.
11.   Realization of a Phase Locked Loop using Voltage Controlled Oscillator (VCO).
12.   Study of D.A.C & A.D.C.

EC 492
DIGITAL ELECTRONIC & INTEGRATED CIRCUITS LAB
Contacts: 3P
Credits: 2
1.   Realization of basic gates using Universal logic gates.
2.   Code conversion circuits- BCD to Excess-3 & vice-versa.
3   .4-bit parity generator & comparator circuits.
4.   Construction of simple Decoder & Multiplexer circuits using logic gates.
5.   Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6.   Construction of simple arithmetic circuits-Adder, Subtractor.
7.   Realization of RS-JK & D flip-flops using Universal logic gates.
8.   Realization of Universal Register using JK flip-flops & logic gates.
9.   Realization of Universal Register using multiplexer & flip-flops.
10.   Construction of Adder circuit using Shift Register & full Adder.

11. Realization of Asynchronous Up/Down counter.
12. Realization of Synchronous Up/Down counter.
13. Design of Sequential Counter with irregular sequences.
14. Realization of Ring counter & Johnson's counter.
15. Construction of adder circuit using Shift Register & full Adder.

Electronic Measurements and Instrumentation Lab
Code: EI 492
Contacts: 3P
Credits: 2

1. Study of static characteristics (accuracy, precision, hysteresis, repeatability, linearity) of a measuring instrument.
2. Study of dynamic characteristic (fidelity, speed of response)
3. Acquaintance with basic structure of DMM and measurement of different electrical parameters
4. Statistical analysis of errors in measurement using computer simulation
5. Study of A/D converter along with its associate circuitry
6. Study of D/A converter
7. Realization of Data Acquisition system
8. Wave and spectrum analysis using Q meter
9. Measurement of HF and VHF

EI 491
TRANSDUCER & SENSORS LAB
Contacts: 3 P
Credit: 2

1. Study of two Channel Voltage to Circuit transmitter (V-I Transmitter)
2. Study of two Channel I-V Receiver (Converter).
3. Temperature measurement using AD590 Semiconductor temperature sensor.
4. Displacement measurement by Capacitive Transducer.
5. Pressure & Displacement measurement by Linear Variable Displacement Transducer (LVDT).
6. Study of load cell. (To study the load cell behavior for tensile & compressive load).
7. Torque measurements by Strain Gauge Transducer.
8. Measurement of linear displacement using Inductive Displacement Transducer.
9. Measurement of speed using Magnetic Pick-Up Proximity Sensor.
10. Relative Humidity measurement using Capacitive Transducer.
11. Displacement measurement by Magnetic Bi-Polar Digital Position Sensor (using Hall Effect).
12. Measurement of angular speed by Stroboscope.
13. Studies of L.D.R
14. Studies of Photo Diodes & Photo Voltaic cells.

TECHNICAL REPORT WRITING & / LANGUAGE PRACTICE LABORATORY
Code: HU 481

Contact: 3

Credits: 2
Topics to be covered and number of hours required for it:

1. Introductory lecture is to be given to the students so that they get a clear idea of the syllabus and understand the need for having such a practice lab in the first place(3 hours)
2. Conversion practice is done on given situation topics. The students are also made to listen to pre-recorded cassettes produced by British Council and also by the Universities of Oxford and Cambridge (6 hours)
3. Group Discussions:- The students are made to understand the difference between the language of conversion and group discussion. Strategies of such discussions are to teach to them. It is also helpful to use videocassettes produced by the U.G.C. on topics like group-discussion. After wards the class is divided into groups and the students have to discuss on given topics on current socio-economic-political-educational importance(12 hours)
4. Interview sessions-students are taught the do's and don'ts of facing a successful interview. They then have to face rigorous practices of mock-interviews. There simulations of real life interview sessions where students have to face an interview panel(12 hours)

5.   Presentations: The secrets of an effective presentation are taught to the students. Then each and every student has to make lab presentations with the help of the Overhead projector/ using power point presentation and other audio-visual aids in the laboratory. They also have to face the question answer sessions at the end of their presentation (12 hours)

6.   Classes are also allotted to prepare the students for competitive examinations like the T.O.E.F.L. by making the students listen to specially produced C.D. cassettes of such examinations (3 hours)

The overall aim of this course is to inculcate a sense of confidence in the students and help them to become good communicators in their social as well as professional lives.

Text:
  1. Sharma—Business Correspondence & Report Writing, TMH
  2. Prasad—Group Discussion & Interview (With Audio Cassette) , TMH

Reference:
  1. Sashi Kumar—Spoken English (with Cassette) , TMH

WEST BENGAL UNIVERSITY OF TECHNOLOGY

Electrical Machines I
EEE 501
Contacts: **3L+1T**
Credits: 4

Transformer : Construction, Operating principles of single phase & three phase transformer, Emf equation, Phasor diagram, Equivalent circuit, Different transformer connections and their vector groups, Scott connection, Paralleling of single phase and three phase transformer, Testing of transformers, Auto Transformers.

DC Machines: Construction of DC machines. Operating principles of DC generator, Emf equation, Different excitation systems, Armature reaction, Commutation, Characteristics of separately excited and self excited generators, Voltage regulation, Parallel operation of DC generators, Operating principles of DC motors, Torque equation, Characteristics of separately excited and self excited motors, Testing of motors, Starting and speed control of DC motors, Speed regulation

BOOKS :

- **Bhimbra P.S.: Electrical Machinery; Khanna Pub**
- Nagrath I.J. & Kothari D.P. : Electric Machines**,** TMH
- Mukherjee P K & Chakraborty S : Electrical Machines ; Dhanpat Rai Pub.
- Sen S K : Electrical Machines ; Khanna Pub.
- Clayton A.E. & Hancock N N : Performance & Design of Direct Current Machines, CBS Pub. & Distributors;
- Parker Smith- Problems in Electrical Engg; - CBS Pub & Distributors.
- Say M G : Performances & Design of A.C. Machines; CBS Publishers & Distributors.
- Gupta: Fundamentals of Electrical Machines, New Age International
- Bhattacharya: Control of Electrical Machines, New Age International
- Bhattacharya: Experiments in Basic Elect Engg, New Age International
- Athani: Stepper Motors

Power Electronics
Code: **EE 504**
Contacts   **3L**
Credits: **3**

Power semiconductor devices PNPN diodes, DIACS Thyristors, TRIACS, G.T.O. devices. Power Transistors, Power MOSFET, Rating, Losses and Cooling. Triggering circuits for SCR's, UJT, Blocking Oscillators, Schmitt trigger circuits – Power MOS gate drive circuits.

Uncontrolled and controlled Rectifiers : Single phase and poly phase Bridge rectifiers. Transformer ratings. Inductive load, free wheeling diodes.
Converter operation: Overlap, power factor, inversion, regulation, P-pulse converters, power factor control via PWM converters.

Electronics & Electronics Engineering Syllabus

D.C. line commutation : Series and parallel capacitor turn off, resonant turn off, impulse commutation.
D.C. Choppers :   Principles, classification, use.

Frequency conversion : Cycloconverter single and three phase circuits, blocked group operation, circulating current mode. Single phase and three phase inverters, constant voltage source and constant current source inverters, HF inverters for heating.

Application : D.C. and A.C. drives, S.M.P.S., Resonant converters, A.C. Line Filters, ratio, interference suppression. HDVC transmission.

BOOKS :

1.   Rammurthy M – An Introduction to Thysistors and their applications
2.   Lauder C W - Power Electronics, 3rd Edn. MHI 1993
3.   Sen P C – Power Electronics, TMH
4.   Rashid M H – Power Electronics, PHI Pub.
5.   Dubey S K – Thysistorised Power Controller; John Wiley & Sons
6.   Singh M D & Khanchandni : Power Electronics ; TMH Pub.
7.   Dewan S B & Stranghen A – Power Semiconductors circuit
8.   Mohan N, Underland T M & Robbins W P : Power Electronics, John Wiley & Sons.
9.   Bose B K : Modern Power Electronic ; Jaico Pub. House
10. Dubey G.K.: Thyristorised Power Controllers, New Age International
11. Subramanyam: Power Electronics, New Age International
12. Sugandhi: Thyristors: Theory & Applications, New Age International

Control Systems
     Code: **EE 503**
     Contacts   **3L+1T**
     Credits: **4**

Concept of feedback and Automatic Control, Electrical analogy of physical system. Transfer Function, Block diagram representation of Control Systems, Block Diagram Algebra, Signal Flow Graph, Mason's gain formula.

Control system components : Error sensing devices, potentiometer, synchros, D.C. and A.C. tachometers,   servomotors**,** modulators and demodulators. Transient analysis of closed loop systems. Transient errors and their minimisation, steady state error and their minimisation, error coefficients, P, PI and P-I-D type controllers.

Stability of Control Systems : R-H criteria, Nyquist criteria, Bode Plots. Polar Plots, Nichols chart, measures of relative stability. Construction of Root Loci for simple system, effects of the movement of poles and zeros.

Improvement of system performance through compensation. Case studies on control voltage, current, frequency, position and speed. Control of liquid level, density, flow, temperature etc.

BOOKS :

1.   Kuo B.C. Automatic Control System, PHI
2.   Das Gupta S : Control System Theory ; Khanna Pub.
3.   Nagrath I J & Gopal M : Control Systems Engineering, New Age International Pub.
4.   Ogata K : Modern Control Engg. PHI
5.   Dorf R C & Bishop R.H.: Modern Control System ; Addison – Wisley
6.   Bolton: Industrial Control & Instrumentation, Orient Longman
7.   Nakra: Theory & Applications of Automatic Control, New Age International
8.   Gopal: Modern Control System Theory, New Age International
9.   Gopal: Digital Control Engineering, New Age International
10. Sinha: Control Systems, New Age International

Electromagnetic Theory
     Code: **EEE 502**
     Contacts: **3L+1T**
     Credits: **4**

Electric field: Potential and potential gradient, Stoke's theorem, Green's theorem, Divergence and Curl equations, Laplace and Poisson's equations, Helmholtz theorem. Field equations in different coordinate systems, Boundary conditions and solution of electrostatic problems.

Electronics & Electronics Engineering Syllabus

Magnetic field: Scalar and vector potential, field equations for Ampere's law, Divergence and curl of magnetic field, Force and Torque equations, Field equations in different coordinated systems, Boundary conditions and solution of magnetic field problems.

Electromagnetic field: Time varying field and Faradays law, Displacement current, energy flow, Poynting theorem, Poynting vector, Maxwells field equations vs. circuit equations, electromagnetic radiation, uniform plane wave equation & solution, skin depth, reflection and refraction of plane waves, RF lines, Smith chart.

Propagation: Different modes of radio wave propagation, ionospheric propagation, MUF, critical frequency, skip distance, duct propagation, troposphere propagation

Reference:
1. Hayt: Engineering Electromagnetics TMH
2. Jordan E.C & Balmain K.G , " Electromagnetic Waves and Radiating systems " Prentice Hall of India , 1971.
3. Kennedy G. " Electronic Communication Systems " 4th ed. , McGraw Hill Book Co ., 1985.
4. John D. Ryder , " Network Lines & Fields " , 2nd ed., Prentice Hall of India,1984.
5. J.D Kraus , "Antennas ", McGraw Hill,3rd ed.
6. J.D Kraus , " Electromagnetics with Applications " , McGraw Hill,5th ed..

Electronics & Electronics Engineering Syllabus

Microprocessor & Micocontroller
Code: EI 502
Contacts: 3L+1T
Credits: 4

Introduction to 8085A CPU architecture-register organization, addressing modes and their features. Software instruction set and Assembly Language Programming. Pin description and features.

Instruction cycle, machine cycle, Timing diagram.

Hardware Interfacing: Interfacing memory, peripheral chips (IO mapped IO & Memory mapped IO).

Interrupts and DMA.

Peripherals: 8279, 8255, 8251, 8253, 8237, 8259, A/D and D/A converters and interfacing of the same.

Typical applications of a microprocessor.

16 bit processors: 8086 and architecture, segmented memory has cycles, read/write cycle in min/max mode. Reset operation, wait state, Halt state, Hold state, Lock operation, interrupt processing. Addressing modes and their features. Software instruction set (including specific instructions like string instructions, repeat, segment override, lock prefizers and their use) and Assembly Language programming with the same.

Brief overview of some other microprocessors (eg. 6800 Microprocessor).

References:

1. Microprocessor architecture, programming and applications with 8085/8085A, Wiley eastern Ltd, 1989 by Ramesh S. Gaonkar.
2. Intel Corp: The 8085 / 8085A. Microprocessor Book – Intel marketing communication, Wiley inter science publications, 1980.
3. An introduction to micro computers Vol. 2 – some real Microprocessor – Galgotia Book Source, New Delhi by Adam Osborne and J. Kane
4. Advanced Microprocessors by Ray and Bhurchandi - TMH
5. Intel Corp. Micro Controller Handbook – Intel Publications, 1994.
6. Microprocessors and Interfacing by Douglas V. Hall, McGraw Hill International Ed. 1992
7. Assembly Language Programming the IBM PC by Alan R. Miller, Subex Inc, 1987
8. The Intel Microprocessors: 8086/8088, 80186, 80286, 80386 & 80486, Bary B. Brey, Prentice Hall, India 1996.

Electrical Machines Lab
EEE 593
Contacts: 3P
Credits: 2

Sl. No.	Name of the experiment	No. of hours	
1.	No load and short circuit test of single phase transformer	3	
2.	Study of transformer connections	3	
3.	No load characteristics of DC generator and build up Phenomenon		3
4.	Load characteristics of DC generator	3	
5.	Speed control of DC shunt motor (Armature & field voltage control with Rheostat)	3	
6.	Swinburn Test		3
7.	Hopkinson Test of shunt machine	3	

Power Electronics Lab
Code: EE 594
Contact: 3P
Credit: 2

Electronics & Electronics Engineering Syllabus

1. STUDY OF V-I CHARACTERISTICS OF AN SCR.
2. STUDY OF V-I CHARACTERISTICS OF A TRIAC.
3. STUDY OF DIFFERENT TRIGERRING CIRCUITS FOR THYRISTOR.
4. STUDY OF UNI- JUNCTION TRANSISTOR (UJT) TRIGERRING CIRCUIT.
5. STUDY OF A FIRING CIRCUIT SUITABLE FOR SINGLE PHASE HALF CONTROLLED CONVERTOR.
6. SIMULATION ON THE SINGLE PHASE AC-DC UNCONTROLLED CONVERTOR WITH & WITHOUT THE SOURCE INDUCTANCE.
7. SIMULATION OF A SINGLE PHASE AC TO CONTROLLED DC CONVERTOR WITH & WITHOUT THE SOURCE INDUCTANCE.
8. SINGLE PHASE HALF CONTROLLED BRIDGE CONVERTOR WITH TWO THYRISTORS & TWO DIODES.
9. SINGLE PHASE FULLY CONTROLLED BRIDGE CONVERTOR USING FOUR THYRISTORS.
10. PSPICE SIMULATION OF DC TO DC STEP DOWN CHOPPER.
11. PSPICE SIMULATION OF SINGLE PHASE CONTROLLER WITH R-L LOAD.
12. **PSPICE SIMULATION OF PWM BRIDGE INVERTOR OF R-L LOAD USING MOSFET.**

Control System Lab
Code: **EE 593**
Contacts: **3P**
Credit: **2**

1) Familarisation with MAT- Lab- control system tool box, MAT –Lab- simulink tool box & PSPICE.
2) DETERMINATION OF STEP RESPONSE FOR FIRST ORDER & SECOND ORDER SYSTEM WITH UNITY FEEDBACK ON CRO &CALCULATIONS OF CONTROL SYSTEM SPECIFICATIONS LIKE TIME CONSTANT , % PEAK OVERSHOOT, SETTLING TIME ETC., FROM THE RESPONSE.
3) SIMULATION OF STEP RESPONSE & IMPULSE RESPONSE FOR TYPE-0 , TYPE-1 & TYPE –2 SYSTEM WITH UNITY FEEDBACK USING MATLAB & PSPICE.
4) DETERMINATION OF ROOT LOCUS, BODE- PLOT, NYQUIST PLOT USING MATLAB- CONTROL SYSTEM TOOLBOX FOR 2ND ORDER SYSTEM & DETERMINATION OF DIFFERERNT CONTROL SYSTEM SPECIFICATIONS FROM THE PLOT.
5) DETERMINATION OF PI, PD,PID CONTROLLER ACTION OF FIRST ORDER SIMULATED PROCESS.
6) DETERMINATION OF APPROXIMATE TRANSFER FUNCTION EXPERIMENTALLY FROM BODE PLOT.
7) EVALUATION OF STEADY STATE ERROR, SETTING TIME, PERCENTAGE PEAK OVERSHOOT, GAIN MARGIN, PHASE MARGIN WITH ADDITION OF LEAD COMPENSATOR & BY COMPENSATOR IN FORWARD PATH TRANSFER FUNCTION FOR UNITY FEED BACK CONTROL SYSTEM USING PSPICE OR OTHERWISE.
8) STUDY OF A PRACTICAL POSITION CONTROL SYSTEM & DETERMINATION OF CONTROL SYSTEM SPECIFICATIONS FOR VARIATION OF SYSTEM PARAMETERS.

Electronics & Electronics Engineering Syllabus

Microprocessor & Microcontroller Lab
Code: **EI 592**
Contacts: **3P**
Credits: **2**

Details same as that of EI 592

Sl. No.	Name of the Experiments	No. of hours
1.	Familiarization with 8085 register level architecture and trainer kit components, including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.	3
2.	a) Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical) b) Assignments based on above.	3
3.	a) Familiarization with 8085 simulator on PC. c) Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. b) Assignments based on above	3
4.	Programming using kit/simulator for i) table look up ii) Copying a block of memory iii) Shifting a block of memory iv) Packing and unpacking of BCD numbers v) Addition of BCD numbers vi) Binary to ASCII conversion vii) String Matching viii) Multiplication using Booth's Algorithm	9
5.	Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit eg, subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc	3
6.	Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding	3
7.	Interfacing with I/O modules: a) ADC b) Speed control of mini DC motor using DAC c) Keyboard d) Multi-digit Display with multiplexing e) Stepper motor	12
8.	Writing programs for 'Wait Loop (busy waiting)' and ISR for vectored interrupts (eg, counting number of pulses within specified time period)	3
9.	Study of 8051 Micro controller kit and writing programs for the following tasks using the kit a) Table look up b) Basic arithmetic and logical operations c) Interfacing of Keyboard and stepper motor	6
10.	Familiarization with EPROM programming and Erasing	3

Elective-I
1. PROCESS CONTROL INSTRUMENTATION
    CODE : EEE 606/1

2. NON CONVENTIONAL ENERGY
    CODE:EEE 606/2

ELECTRICAL MACHINES - II
CODE : EEE 601
CONTACTS : 3L + 1T

Electronics & Electronics Engineering Syllabus

CREDITS : 4

SYNCHRONOUS MACHINES – TYPES & CONSTRUCTION. EMF EQUATION & METHODS OF HARMONIC REDUCTION. VOLTAGE REGULATION – SYNCHRONOUS IMPEDANCE METHOD USING O.C. & S.C TEST, M.M.F. METHOD. ZERO POWER FACTOR TEST – POTIER REACTANCE. TWO REACTION THEORY.
PARALLEL OPERATION OF ALTERNATORS – SYNCHRONISATION METHODS.
STARTING OF SYNCHRONOUS MOTORS.
V – CURVES, EXCITATION CONTROL. POWER EQUATION & CONTROL OF SYNCRONISING POWER. HAUNTING & DAMPER WINDING.

INDUCTION MOTOR – CONCEPT OF ROTATING MAGNETIC FIELD, STARTING METHODS. TORQUE-SPEED CHARACTERISTICS. CIRCLE DIAGRAM, SPEED CONTROL. TESTING & PARAMETERS OF EQUIVALENT CIRCUITS.

FRACTIONAL HORSE POWER MACHINES – SINGLE PHASE INDUCTION MOTOR. SINGLE PHASE COMMUTATOR MOTOR – COMPENSATION. RELUCTANCE MOTOR, PERMANENT MAGNET MACHINES, STEPPER MOTOR.

BOOKS

ALTERNATING CURRENT MACHINES – A. Langsdorff
ELECTRICAL MACHINES – BHIMBRA
AC COMMUTATOR MOTORS – Taylor
FRACTIONAL HORSE POWER MOTORS – Veinott

ELECTRICAL MACHINES – II LAB
CODE : EEE 691
CONTACTS : 3P
CREDITS : 2

1. TESTING OF ALTERNATORS – SYN. IMPEDANCE METHOD.
2. Z.P.F. TEST & POTIER REACTANCE (NON-SALIENT POLE MACHINE) DETERMINATION.
3. DETERMINATION OF X_d & X_q AND REGULATION OF SALIENT POLE MACHINE AND PLOTTING OF V CURVE
4. PARAMETER DETERMINATION BY NO-LOAD & BLOCKED ROTOR TESTS OF 3 PHASE INDUCTION MOTOR.
5. USE OF STAR/DELTA STARTER, LOAD TEST OF 3 PHASE INDUCTION MOTOR.
6. STARTING & SPEED-TORQUE CHARACTERISTIC OF SINGLE PHASE INDUCTION MOTOR.

ELECTRIC DRIVES
CODE : EEE 604
CONTACTS : 3L + 1T
CREDITS : 4

INTRODUCTION TO DC MOTOR DRIVE, CHARACTERISTICS OF DC MOTORS, SPEED REGULATION OF DC MOTORS BY PHASE CONTROLLED CONVERTER, SPEED REGULATION OF DC MOTOR BY DC CHOPPER, REGENERATIVE DRIVES, RECENT DEVELOPMENTS.

INTRODUCTION TO AC MOTOR DRIVE, CHARACTERISTICS OF AC INDUCTION MOTOR, SPEED REGULATION OF 3 PHASE INDUCTION MOTOR BY VOLTAGE & CURRENT SOURCE INVERTER, RECENT DEVELOPMENTS.

CONTROL TECHNIQUES OF POWER-ELECTRONIC DRIVES, MICROCONTROLLER & DSP BASED DRIVES.

INTRODUCTION TO ARTIFICIAL INTELLIGENCE BASED DRIVES.

BOOKS

POWER ELECTRONICS – RASHID
POWER ELECTRONICS – RASHID & KHANCHANDANI
POWER ELECTRONICS – P. C. SEN
SOLID STATE AC DRIVES – B. K. BOSE

ELECTRIC DRIVES LAB
CODE : EEE 694
CONTACTS : 3P
CREDITS : 2

1. STUDY OF PHASE – CONTROLLED RECTIFIER (FULL CONVERTER) BASED DC MOTOR DRIVE.
2. STUDY OF DC – CHOPPER BASED DC DRIVES
3. STUDY OF IGBT BASED 3-PHASE INDUCTION MOTOR DRIVE.
4. GENERATION OF PWM CONTROL SIGNAL FOR MOSFET INVERTER USING MICROCONTROLLER.
5. GENERATION OF PWM CONTROL SIGNAL FOR MOSFET INVERTER USING DSP (TMS320050).
6. PSPICE SIMULATION OF MOSFET CHOPPER BASED DC DRIVES.
7. PSPICE SIMULATION OF MOSFET INVERTER BASED INDUCTION MOTOR DRIVE.

POWER SYSTEM - I
CODE : EEE 603
CONTACTS : 3L + 1T
CREDITS : 4

OVERHEAD LINES – TYPES OF CONDUCTORS & SUPPORT STRUCTURES. CALCULATION OF INDUCTANCE & CAPACITANCE OF OVERHEAD LINES & CABLES.

TYPES OF INSULATORS IN TRANSMISSION LINES – STRING EFFICIENCY.

DESIGN OF OVERHEAD LINES – SAG, TENSION, SPACING FOR EHV LINES, CORONA LOSS – RELATED IEE RULES.
CABLES – DIELECTRIC STRESS & GRADIENT, LEAKAGE, LOSS & HEATING – CAUSES OF FAILURE.

PERFORMANCE OF LINES – SHORT, MEDIUM & LONG LINES, NOMINAL & EQUIVALENT T & ∏ CIRCUIT REPRESENTATION, SURGE IMPEDANCE, FERRANTI EFECT, REGULATION & LINE LOSS.

PER UNIT SYSTEM – ADVANTAGE, CONVERSION OF IMPEDANCE & CHANGE OF BASE FOR ALTERNATORS & TRANSFORMERS (DIFFERENT 3 PHASE CONNECTIONS)

POWER TRANSMISSION – EXPRESSION FOR ACTIVE & REACTIVE FLOW & ITS EFFECT ON BUS VOLTAGE. PHASE SHIFT & TORQUE ANGLE.

GROUNDING SYSTEMS – PROTECTION AGAINST SYMMETRICAL FAULT, COMPUTATION OF BREAKER RATING. ASYMMETRICAL FAULTS – ANALYSIS USING POSITIVE, NEGATIVE & ZERO SEQUENCE COMPONENTS. DIFFERENTIAL PROTECTION OF BUS BARS, ALTERNATORS, TRANSFORMERS. USE OF C.T. & P.T IN POWER SYSTEM. SEQUENCE SEGREGATION FILTER FOR UNBALANCED FAULT COMPONENTS.

BOOKS

POWER SYSTEM – I LAB
CODE : EEE 693
CONTACTS : 3P
CREDITS : 2

1. SIMULATION OF TRANSMISSION LINES & MEASUREMENT OF ACTIVE POWER FLOW USING MODEL OF SHORT LINES.
2. STUDY OF SYMMETRICAL FAULT OF A POWER SYSTEM WITH GENERATING SOURCES.
3. MEASUREMENT & VERIFICATION OF ACTIVE & REACTIVE POWER FLOW. COMPENSATION OF VAR AT THE RECEIVING END USING LONG LINE MODEL.
4. SEQUENCE FILTERS WITH 3 PHASE UNBALANCE FAULTS & STUDY OF THEIR PERFORMANCE.
5. EXPERIMENTS ON DIFFERENTIAL RELAYS FOR PROTECTION OF BUS BARS, ALTERNATORS & TRANSFORMERS.
6. PROTECTION SYSTEM FOR FAILURE OF PROME MOVER & EXCITATION OF ALTERNATORS.

HEAT POWER ENGINEERING
CODE : ME 602
CONTACTS : 3L + 1T
CREDITS :4

Electronics & Electronics Engineering Syllabus

WATER TUBE & FIRE TUBE BOILERS, CIRCULATING PRINCIPLES, FORCED CIRCULATION, CRITICAL PRESSURE, SUPERHEATERS, REHEATERS, ATTEMPERATORS, INDUCED DRAUGHT, FORCED DRAUGHT AND SECONDARY AIR FANS, BOILER PERFORMANCE ANALYSIS AND HEAT BALANCE. COMBUSTION SYSTEMS, ENVIRONMENTAL PROTECTION – ESP, CYCLONE SEPARATOR, DUST COLLECTOR ETC.

ROTARY THERMODYNAMIC DEVICES – STEAM TURBINES & THEIR CLASSIFICATIONS – IMPULSE & REACTION TYPE TURBINES, THERMODYNAMICS OF COMPRESSIBLE FLUID-FLOW, EQUATION AND CONTINUITY – ISENTROPIC FLOW THROUGH NOZZLES, VELOCITY DIAGRAM, BLADE EFFICIENCY, OPTIMUM VELOCITY RATIO, MULTI-STAGING, VELOCITY & PRESSURE COMPOUNDING, LOSSES IN TURBINES, EROSION OF TURBINE BLADES, TURBINE GOVERNING, PERFORMANCE ANALYSIS OF TURBINE, CONDENSING SYSTEM.
IC ENGINES – CLASSIFICATION. ANALYSIS OF A STANDARD CYCLE, FUEL CHARACTERISTIC OF SI & CI ENGINE, COMBUSTION, ENGINE PERFORMANCE. AUTOMOTIVE ENGINE EXHAUST EMISSION AND THEIR CONTROL.

GAS TURBINE ANALYSIS – REGENERATION - REHEATING, ISENTROPIC EFFICIENCY. COMBUSTION EFFICIENCY.

TEXT:

1. P.K.NAG- ENGINEERING THERMODYNAMICS – TMH ,2/E

2. P K NAG- POWER PLANT ENGG. - TMH PUB

3. P.S. BALLANEY- THERMAL ENGINEERING – KHANNA PUB

4. DOMKUNDWAR & ARORA- POWER PLANT ENGINEERING –.DHANPAT RAI & CO.

REFERENCE:
1. CENGEL --- THERMODYNAMICS , 3/E ,TMH
2. ET-WAKIL—POWER PLANT ENGINEERING , MH
3. M W ZEMANSKY & R.H.DITTMAN -HEAT AND THERMODYNAMICS – MCGRAW HILL ,7/E

HEAT POWER ENGG. LAB
CODE: ME 692
CONTACTS: 3P
CREDITS: 2

1. STUDY OF CUT MODELS – BOILERS IC ENGINES

   ❖ LANCHASHIRE BOILER
   ❖ BABCOCK & WILLCOX BOILER
   ❖ COCHRAN BOILER
   ❖ VERTICAL TUBULAR BOILER
   ❖ LOCOMOTIVE BOILER
   ❖ 4S DIESEL ENGINE
   ❖ 4S PETROL ENGINE
   ❖ 2S PETROL ENGINE

2. LOAD TEST ON 4 STROKE PETROL ENGINE & DIESEL ENGINE BY ELECTRICAL LOAD BOX.
3. LOAD TEST ON 4 STROKE DIESEL ENGINE BY ROPE BRAKE DYNAMOMETER.
4. HEAT BALANCE ON 4 STROKE DIESEL ENGINE BY ROPE BRAKE DYNAMOMETER & BY ELECTRICAL LOAD BOX.
5. VALVE TIMING DIAGRAM ON 4S DIESEL ENGINE MODEL & 4S PETROL ENGINE MODEL.
6. TO FIND THE CALORIFIC VALUE OF DIESEL FUEL & COAL BY BOMB CALORIMETER.
7. TO FIND THE FLASH POINT & FIRE POINT OF PETROL & DIESEL FUEL.
8. TO FIND THE CLOUD POINT & POUR POINT OF PETROL & DIESEL FUEL.
9. TO FIND CARBON PARTICLE PERCENTAGE IN DIESEL ENGINE EXHAUST SMOKE BY SMOKEMETER AND TRACE THE BHP VS. % CARBON CURVE.
10. MEASUREMENT OF THE QUALITY OF STEAM – ENTHALPY & DRYNESS FRACTION.
11. TO FIND OUT THE BOILER PERFORMANCE – BOILER EFFICIENCY & STEAM EVAPORATION RATE.
12. TO VISIT A THERMAL POWER STATION & STUDY OF THE FOLLOWINGS :

A) BOILER	B) STEAM PIPE	C) FURNACE
D) ECONOMIZER	E) PREHEATER	F) STEAM TURBINES
G) ALTERNATOR	H) WATER TREATMENT PLANT	I) E. S. P.

ACTIVE & PASSIVE NETWORK SYNTHESIS
CODE : EEE 605
CONTACTS : 3L
CREDITS :3

PROPERTIES OF P. R. FUNCTION FOR PASSIVE SYNTHESIS.

DRIVING POINT SYNTHESIS. CAMER & FOSTER METHODS.
TRANSFER FUNCTION SYNTHESIS (BOLT DUFFION METHOD)
PASSIVE FUILTER DESIGN(CONSTANT K & M DERIVED).

ACTIVE SYNTHESIS
FILTER CHARACTERISTICS- BUTTERWORTH, CHEBYSHEV & BESSEL FILTERS.
REALISATION USING VCVS, NIC, INIC & IMPEDANCE CONVERTER & INVERTER NETWORK USING OP AMPS & DISCRETE COMPONENTS. TUNABALE FILTERS.
SENSITIVITY ANALYSIS FOR OPAMP BASED FILTERS USING R-C NETWORKS.

BOOKS

RC NETWORK SYNTHESIS – HUELSMAN
                                          - S. K. MITRA
NETWORK SYNTHESIS – VAN VALKENBERG

ELECTIVE I
PROCESS CONTROL INSTRUMENTATION
CODE : EEE 606/1
CONTACTS : 3L
CREDITS : 3

INTRODUCTION TO PROCESS CONTROL, ANALOG SIGNAL CONDITIONING, DIGITAL SIGNAL CONDITIONING, THERMAL SENSORS, MECHANICAL SENSORS, OPTICAL SENSORS, SMART SENSORS,

DISCRETE – STATE PROCESS CONTROL (PROGRAMMABLE LOGIC CONTROLLER), ANALOG CONTROLLER, DIGITAL CONTROLLER, CONTROL LOOP CHARACTERISTICS, COMPUTER CONTROL OF PROCESSES

BOOKS

PROCESS CONTROL INSTRUMENTATION TECHNOLOGY – C. D. JHONSON
HAND BOOK OF PROCESS CONTROL – CONSIDINE
PROCESS CONTROL HANDBOOK – LIPTAK

ELECTIVE I
NON CONVENTIONAL ENERGY
CODE : EEE 606/2
CONTACTS : 3L
CREDITS : 3

INTRODUCTION – CONCEPT OF ENERGY, ENERGY & SOCIETY, WORLD ENERGY SCENARIO.

NEW ENERGY TECHNOLOGY – PROSPECTS OF RENEWABLE / NON CONVENTIONAL ENERGY SOURCES.

SOLAR ENERGY – SOLAR RADIATION, COLLECTOR, ENERGY STORAGE SYSTEM & UTILISATION.

WIND ENERGY – BASIC PRINCIPLE OF WIND ENERGY CONVERSION, TYPES OF WIND GENERATORS, SELECTION, INSTALLATION & MAINTENANCE OF WIND MACHINES.

GEO THERMAL & OCEAN THERMAL ELECTRIC ENERGY – MAGNETO HYDRODYNAMICS.

NUCLEAR ENERGY – FUSSION & CONTROL OF PROCESS, DIFFERENT TYPES OF STORAGE SYSTEMS
MICRO HYDEL PROJECTS.

INTEGRATED STAND ALONE SYSTEM OF DIFFERENT NON CONVENTIONAL ENERGY SYSTEMS.

INTRODUCTION TO ENERGY CONSERVATION & AUDIT.

Electronics & Electronics Engineering Syllabus

BOOKS

NON CONVENTIONAL ENERGY SOURCES – G. D. RAI

West Bengal University of Technology
Structure & Academic Curricula for B. Tech in
Electrical
&
Electronics Engineering

SEVENTH SEMESTER

Elective-II
a.   HVDC Transmission
b.   Power Generation Economics
c.   Utilization of Electric Power
d.   Illumination Technology

POWER SYSTEM -II

Code : EEE 701
Contacts : 3L + 1T
Credits :3

Nature of faults in electrical systems, fault calculations, symmetric and asymmetric faults – method of sequence components – sequence networks.

Protective relays and their applications to power apparatus and systems.

Principles of circuit breakers – different types, oil circuit breakers, air circuit breakers, vacuum circuit breakers, SF6 – circuit breakers , their uses and comparison.

Steady state stability : Power angle equation. Maximum power in terms of T-parameters. Transient stability of power system. Dynamics of synchronous machine. Power angle equation. Node elimination technique. Transient stability. Equal area criterion. Swing equation. Critical clearing angle. Factors affecting transient stability.

Computer methods in Power System Analyses, load Flow Studies.

BOOKS :
1.   Nagrath & Kothari – Power System Engg.- TMH
2.   Rao S S – Switchgear & Protection ; Khanna Pub
3.   Van Warrington A R – Protective Relaying Vol I; Chapman Hall
4.   Van Warrington A R – Power System Protection Vol II; Chapman Hall
5.   Singh, Electric Power Generation, Transmission & Distribution, PHI
6.   Sauer, Power Systems-Dynamics & stability, Pearson Education
7.   Mason – The Art & Science of Protective Relaying, Wiley
8.   Electrical Transmission & Distribution Reference Book; Westinghouse
9.   Wadhwa C. L. : Electrical Power System, New Age Intl. (P) Ltd.
10. Stevenson Jr., Power System Analysis – International Student Edition
11. El-abiad & Stagg – Computer Methods in Power System
12. M A Pai – ComputerTechniques & Power systems
13. Jayachrista, Power System Analysis,Scitech

MULTIMEDIA SYSTEMS

Code: IT-711
Contacts: 3L
Credits: 3

Electronics & Electronics Engineering Syllabus

Allotted Hrs.: 45L

Introduction to Multimedia: Overview, Importance, Components, Uses of multimedia, Future Hypertext and hypermedia, different media and channels and modes of communication.
Multimedia Resources: Data rate, cost effectiveness and production time considerations, Analog and digital representations, Image, Video and Audio Standards, Colour space and models, communication standards - ISDN, ATM
Equipment and devices: Display screen, storage devices, communication and interactive peripherals.
Test: Attributes and guidelines, Text markup, HTML, models of hypertext document, XML
Digital Graphics: Vector and raster graphics, Graphics file formats, image manipulation.
Audio: Digital audio, MIDI, Processing sound, sampling, compression.
Video: MPEG Compression standards, Compression through Spatial and Temporal Redundancy, inter-frame and intra-frame Compression.
Animation: Types, techniques, key frame animation, utility, Morphing
Compression techniques: Lossless and lossy compression, Simple compression techniques Interpolative, Predictive, Transform Coding, Discrete Cosine Transform, Statistical Coding - Huffman encoding. JPEG, MPEG
Design and development of multimedia: Tools to support multimedia development, Authoring Multimedia - different type of authoring environments, Media synchronization, Design process, development team Evaluation and Testing - Gagne events, Project management.
Human Computer Interaction (HCI): Objective, norms and guidelines, Shneiderman's rules for design, Norman's seven stages of action, Interaction Design & Notations - Meta notations and state transition graphs, Screen design norms and guidelines.
Multimedia information management application: Multimedia database and design consideration.
Intellectual property: Foundations of intellectual property, copyrights, issues regarding the use of intellectual property.
Future developments: Virtual reality, newer devices, performance support, knowledge management, interactive interfaces

Text Books:

1. Ben Shneiderman - "Designing the User Interface", Addison Wesley Longman Publishing Co. (ISBN:0-201-69497-2)
2. Halsall,Mulimedia Communication, Pearson Education
3. Jakob Nielsen - "Hypertext and hypermedia", Boston, Academic Press, 1990
4. Arch C Luther - "Design interactive multimedia", Bantam Books, NY, 1992
5. Andleigh & Thakrar, Multimedia Systems, PHI
6. Corough, Multimedia Systems & Web Design, Vikas

References:

1. D Norman - "Design of Everyday Things" - M.I.T. Press, 1998. (ISBN 0-262-64037-6)
2. Jeff Burger - "Multimedia for decision makers: a business primer", Pearson Education,
3. Chapman, N. and Chapman J. - "Digital multimedia", John Wiley, 2000
4. Elsom Cook - "Principles of Interactive Multimedia", McGraw Hill, 2001, ISBN 007-709610
5. Buford, J. K., - "Multimedia Systems", Pearson Education Asia, 2000
6. Vannevar Bush (Foundation Paper) - "As we may think"

ELECTRICAL MACHINE DESIGN
Code: EEE 702
Contacts : 3L + 1T
Credits : 3

Basic design principles and approaches, specification, Magnetic and electric loading, out put equations and output coefficients, Main dimensions. Ratings, Heating cooling and temperature rise.

Transformer : Magnetic circuit, core construction and design, winding types, insulation, Loss allocation and estimation, Reactance, Temperature rise.

D C Machine: No. of poles and main dimensions, armature, windings, Magnetic circuit and Magnetisation curve, Commutator and brushes.

Induction Machine-3 phase: Rating specifications, standard frame sizes, Main dimensions specific loadings, Design of stator windings, Rotor design – slots and windings, calculations of equivalent circuit parameters.

Computer assisted design of above machines.

BOOKS:

1. Sawhney A K; A Course in Electrical Machine Design; Dhanpat Rai & Co.
2. Clayton A E & Hancock N N :   The Performance and Design of Direct Current Machines ; CBS Publishers and Distributors
3. Say M G : The Performance and Design of Alternating Current Machines; CBS Publishers and Distributors.
4. Sen S K : Principles of Electrical Machine Design with Computer Programs ; Oxford & IBH Pub. Co.
5. Norton, Machine design, Pearson Education

DIGITAL SIGNAL PROCESSING :
Code :EEE-703
Contacts : 3L + 1T
Credits :3

Introduction : Discrete and continuous time signals and systems. Data acquisition and conversion including multi-channel data converter and monitors. Stability, linearity and causality of linear shift in variant signal transmission and processing. Review of Z-transformation. .

DFS : Its properties, Fourier representation of finite duration sequences.

DFT : Representation of periodic sequence computational algorithms.

Fast Fourier Transformation (FFT): Computational considerations. Digital Filters: Structures, different forms, finite impulse response (FIR) and Infinite Impulse response (IIR). Flow graph representation of digital filter. Digital filter design: IIR filter design by impulse invariant and bilinear transformation. FIR filter design using windows and frequency sampling method. Effect of finite register length in DSP and effect of quantization of filter parameters in the filter design.

Computer control of processes – supervisory and direct digital control. Simple filter design using MATLAB.
Introduction to DSP hardwares : Architectural features, Fixed point processors, floating point processors. Control and Instrumentation application – Telemetry and metering.

BOOKS :

1.   Mitra S : Digital Signal Processing - A computer based approach ; TMH
2.   Proakis J.C. & Manslakis M G: Digital Signal Processing : Principles, Algorithms & Applications: PHI/ Pearson Education
3.   Chen, Digital Signal Processing , OUP
4.   Johnson, Digital Signal Processing, PHI
5.   Babu Ramesh, Digital Signal Processing,Scitech
6.   Ingle, Digital Signal Processing Using MATLAB,Vikas
7.   Ifeachor, Digital Signal Processing, Pearson Education
8.   Salivahanan S, Vallavaris A, Gnanpruja C: Digital Signal Processing ; TMH Pub.
9.   Oppenhein A V & Shaffer R.W. : Digital Signal Processing, Pearson Education /PHI;
10.   Oppenhein A V & Shaffer R.W : Discrete time Signal Processing, Pearson Education /PHI;

11.   Rabiner L R & Gold B : Theory & Applications of Digital Signal Processing, PHI

ELECTIVE-II

HVDC TRANSMISSION
Code: EE-704(a)
Contacts: 3L
Credits: 3

AC/DC Conversion - Hg. Arc, SCR, Bridge rectifier and inverter circuits. Recent trends of HVDC valves. Principles of grid control, firing angle control, harmonic analysis, commutation failure, starting and stopping of DC Link.

Reactive Power requirement, types of forced commutation. Corona and Radio interference, protective devices.

Smoothing reactors - Functions, double commutation failure, consequent commutation failure - their prevention.

Simulation of HVDC systems, Parallel operation of HVDC and AC systems, multiterminal DC systems.

Stability of AC/DC interconnected systems.

Books:

1.   Chakraborty A, Kothari D P, Mukhopadhyay A K - The Performance, Operation and Control of EHV Power Transmission Systems; Wheeler Pub.
2.   Das Begamudre R - The E H V A C Transmission - New Age International.

POWER GENERATION ECONOMICS
Code: EE-704(b)
Contacts: 3L
Credits: 3

Cost of Power Generation - Thermal, Hydro and Nuclear - Types of Consumers in a distribution system - Domestic, Commercial, Industrial etc. Concepts of load factor, power factor, diversity factor, demand factor.

Electricity Tariff - Block rate, flat rate, two part, three part tariffs. Subsidization and cross subsidization. Availability tariff of generation companies. Pool tariff of transmission companies.

Economics of Power Generation - Incremental fuel cost. Unit commitment. Spinning reserve.
Economic Dispatch - Computation of transmission loss. Active and reactive power optimization. Upper and lower frequency limits. Optimal hydro - thermal scheduling.

Books:

1. Kirchmayer, L K - Economic Operation of Power Systems - John Wiley, New York
2. Nagrath, I J & Kothari, D P - Modern Power System Analysis - Tata McGraw Hill
3. Elgerd O L - Electric Energy System Theory - McGraw Hill

UTILIZATION OF ELECTRIC POWER
Code: EE-704 (c)
Contacts: 3L
Credits: 3

Traction: System of track electrification, train movement and energy consumption (speed time curves, crest speed, average speed and schedule speed) rctive effort, factors affecting energy consumption (dead weight, acceleration weight and adhesion weight) starting and braking of traction motors, protective devices.
Illumination: Laws of illumination, polar, curves, photometry, integrating spheres, types of lamps, lamp fittings, Light control, design aspects of indoor and outdoor lighting.
Welding: Its classification, resistance, arc and ultrasonic welding, characteristics of welding transformers - modern welding techniques and control.
Heating: Resistance heating, induction and dielectric heating.
Electrolytic Processes: Electroplating, Anodizing, Electro-cleaning, Electro extraction etc.

Books:

1. Wadha C L - Utilization of Electric Power; New Age International
2. Wadha C L - Generation, Distribution and utilization of electrical energy; New Age International Ltd.
3. Singh, Electric Power Generation, Transmission & Distribution, PHI
4. Partab H - Art and Science of Utilization of Electrical Energy; Dhanpat Rai & Sons
5. A T Dover - Electric Traction

ILLUMINATION TECHNOLOGY
Code: EE-704 (d)
Contacts: 3L
Credits: 3

Sources of light: Day light, artificial light sources, energy radiation, visible spectrum of radiation, black body radiation and full radiator. Incandescence, dependence of light o/p on temperature. Theory of gas discharge and production of light. Perception of light and colour, optical system of human eye, eye as visual processor. Reflection, refraction and other behaviour of light.

Measurement of light - radiometric and photometric quantities, units of measurement, standardization. Measurement of light distribution, direct and diffused reflection, fundamental concepts of colourimentry and measurement of colour.

Types of lamps: GLS, Tungsten - halogen, Discharge, low pressure sodium vapour fluorescent, metal - halide, IR and VV lamps - their construction, filament material, theory of operation, life, characteristics and application.

Design, objectives and specifications of lighting and systems; design of luminance, electrical circuits and auxiliaries, basic lighting design, consideration and lighting parameters for extension lighting, interior lighting and day lighting.

Energy conservation in lighting.

Books:

1. Wadha C L: Utilization of Electric Power - New Age International Ltd.
2. Wadha C L: Generation, Distribution and Utilization of electrical energy - New Age International Ltd.
3. Singh, Electric Power Generation, Transmission & Distribution, PHI
4. Partab H: Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Sons.

5.   Fink & Beaty - Standard Hand Book for Electrical Engineers - McGraw Hill International.

POWER SYSTEM LAB
Code : EEE 791
Contacts : 2P
Credits : 2

1. Study on (i) on load Time Delay Relay (ii) off load Time Delay Relay
2. Polarity, Ratio and Magnatisation Characteristics Test of CT & PT
3. Testing on (i) Under Voltage Relay and (ii) Earth Fault Relay
4. Study on D C Load Flow
5. Study of A C Load Flow Using Gauss – Seidel Method
6. Study of A C Load Flow Using Newton Raphson Method
7. Study on Economic Load Dispatch
8. Study of Transformer Protection by Simulation
9. Study of Generator Protection by Simulation
10. Study of Motor Protection by Micon Relay
11.   Study of Different Characteristics of Over Current Relay

ELECTRICAL MACHINE DESIGN LAB
Code : EEE 792
Contacts : 2P
Credits :2

Design of Transformer core, windings and calculations of performances.

Estimation of main dimensions of d.c. machines after selecting poles, Design of poles and armature windings.

Calculations of main dimensions of Induction motors and design of stator windings and selection of slots. Design of (i) squirrel cage and slip-ring rotors.

MULTIMEDIA SYSTEM LAB
Code: IT-781
Contacts: 3P
Credits: 2

1.   Web document creation using Dreamweaver (6P)
2.   Image manipulation and editing with Photoshop (6P)
3.   Audio recording and editing (3P)
4.   Creating animation using Flash (9P)
5.   Individual Project: Development of personal web page and documentation (6P)
6.   Main Project: Group project, complete design documents, implementation of an application (15P).

ASSIGNED PROJECT
Code: EEE-781
Credit: 2

Evaluation of the Practical Training undergone for 6 weeks during summer vacation after 6th semester.

SEMINAR ON ASSIGNED / SELECTED TOPICS
Code: EEE-782
Contacts: 3P
Credit: 2

Seminar based on contemporary assigned / selected topics.

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West Bengal University of Technology

Structure & Academic Curricula for B. Tech in Electrical & Electronics Engineering

EIGHTH SEMESTER

Electronics & Electronics Engineering Syllabus

VALUES & ETHICS IN PROFESSION

HU-801
Contracts:3L
Credits- 3

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development
Energy Crisis: Renewable Energy Resources
Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics
Appropriate Technology Movement of Schumacher; later developments
Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.
Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society
Nature of values: Value Spectrum of a good life
Psychological values: Integrated personality; mental health
Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.
Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity
Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

INDUSTRIAL MANAGEMENT

Code: HU-802
Contacts : 3L
Credit: 3

Basic concepts of management, objectives, classification and hierarchy, different schools of management thought, principal functions of management, Management as an organizing and directing force, Structure of the management decision making process, Organization structure, authority and responsibility, Organisation dynamics, Managerial leadership, communication systems, Managing human factors in business and industry, Industrial relation, Union activities, trade union acts, collective bargaining, disciplinary procedure.

Organizational objectives and long range forecasting, planning, organizing, programming and controlling process, managerial control strategies; quantity and quality control, cost benefit analysis, present work and breakeven analysis, budgetary control, use of management science for the efficient administration of economic units, production, financial and marketing management.

Adoption of statistical and computer methods and techniques to managerial research and managerial decision making and general management.

Books:

1. Industrial Management - S C Jain, W S Bawa, Dhanpat Rai & Co. (P) Ltd.
2. Industrial Management, Vol.1 L.C. Jhamb, EPH,
3. Industrial Engineering & Production Management - Martand Telsang, S. Chand
4. Industrial & Business Management - Martand T. Telsang, S. Chand
5. Introduction to Materials Management - J Tony Arnold & Stephen N. Chapman, Pearson Education Asia
6. Production & Operations Management – Adam, Pearson Education /PHI
7. Industrial Relations, Trade Unions & Labour Legislation - Sinha, Pearson Education Asia

8.   Business Organisation & Management - Tulsian, Pearson Education Asia.

FINANCIAL MANAGEMENT AND ACCOUNTS

Code: EEE 801
Contacts: 3L
Credits: 3

Introduction: Fundamental Concepts, factors of Production, Demand and supply, Consumer behaviour, Demand-functions, elasticity of demand and demand forecasting, theory of firm, Engineering economics, Equivalence, value of time, present value and annual equivalent cost, rate of return, replacement analysis, Evaluation of public activity socio-economic considerations. Materials Management and inventory. Market structure, pricing and output decisions under different market conditions. Technological considerations under competitive economic and business environments. Financial statements, double-entry book keeping. Cash and revenue, price and income etc., cost concepts, volume profit analysis, breakeven analysis-its application/cost in engineering and management decision making.

Introduction to book-keeping and accounting, Preparation of final accounts. Interpretation of final accounts through ratio analysis, fund flow, cash flow, Investment, capital structure and dividend decisions. Working capital management. Failure and re-organisation of a business.

Production & cost analysis - use of production and demand functions. Determination of price - pricing under different objectives. Roles, objectives and goals of financial management.

Industrial financing - capital formation and growth. Foreign Industries - export, import and balance of trade.

Books:

1.   Riggs J L - Engineering Economics
2.   I.M Pande, Financial Management, Vikas
3.   Financial Mgmt, Khan & Jain, TMH
4.   Horngreen, Introduction to Financial Accounting, Pearson Education
5.   Ramachandran, Accounting & Financial Mgmt, Scitech
6.   Dean J - Managerial Economics, PHI
7.   Maheswari, Managerial Economics, PHI
8.   Samuelson - Economics
9.   White, Agree & Case - Principles of Engineering Economic Analysis, John Wiley, 1977
10.   Batliboi - Double Entry Book Keeping.

ELECTIVE-III

Microprocessor Based System
Code   : EEE 802(a)
Contacts : 3L
Credits   : 3

INTRODUCTION
Block Diagram of a typical microprocessor based system pointing out the role of microprocessor and other peripheral blocks.

MICROPROCESSOR
Review: Intel 8086/8088 Microprocessor: Architecture, Clock Generator, Resetting the microprocessor, Wait State Inserting, Bus Buffering, Interrupts, and Assembly Language Programming.

ADDING MEMORY
Classification, Memory Timing, Interfacing requirements, Interfacing Slow Memory, Interfacing Static RAM (6116 – 2K, 6264 – 8K), Interfacing EPROM (2764 – 8K, 27256 – 32K), Address decoding (using logic gates and decoders, using PAL), Designing Memory Modules (higher capacity say 512K) using memory chips (say 8K), Interfacing Memory Modules to the microprocessor, Interfacing Dynamic RAM, Non Volatile Memories

ADDING INPUT/ OUTPUT DEVICES
Designing an 8-bit input port, Designing an 8-bit output port, I/O space, Address decoding for Memory mapped I/O and I/O mapped I/O
Review: I/O Controllers – 8255A, 8250/1, 8279, 8253/4, 8259A, 8237A
Interfacing of Digital I/O Devices: Handshaking Logic, Programmed I/O, Interrupt driven I/O, Direct memory access, High Power Device Interfacing – Wave shaping, Driving and level shifting, Isolation
Examples: Interfacing and assembly language monitor program for Key Board (one dimensional, two dimensional) through 8255A and 8279, Centronics-type Parallel Printer through 8255A, Display (7-segment, dot-matrix, alphanumeric) through 8255A and 8279, Data Transfer between two microprocessor based systems through 8255As, Mechanical and solid state Relays, Stepper Motor etc.

Analog Interfacing and Industrial Control: Review of Operational amplifier characteristics and circuits, Sensors and transducers (light sensors, temperature sensors, Force and pressure transducers, etc.), signal conditioning – multiplexing, linearization and scaling, 4-20 mA current loop

Examples: Interfacing and assembly language monitor program for D/A Converter (MC1408 8-bit D/A, DAC 1208 12-bit D/A etc.), A/D Converter (ADC0808 8-bit ADC, ICL7109 12-bit ADC etc.)

ADDING TOGETHER
Designing microprocessor based systems with monitor programs for single/ multipoint Temperature Monitoring, Data Logger, PID Controller, etc.

EMBEDED CONTROLLER
Intel 8051 embedded controller – Architecture and Assembly language programming, system design using 8051

COMMUNICATING WITH OTHERS
Asynchronous serial data communication, Serial Data transmission methods and standards, RS-232C Serial Data Standard (Rs-232C to TTL interfacing, RS-232C signal definitions, Connection), Modems

References:
1. Douglas V. Hall – Microprocessors & Interfacing, Tata McGraw-Hill
2. Mohamed Rafiquzzaman – Microprocessors and Microcomputer based system Design, PHI
3. Muhammad Ali Mazidi – The 8051 Microcontroller and embedded systems, Pearson Ed. Asia
4. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
5. Predko, Programming & Customising 8051 Microcontroller, TMH
6. John Uffenbeck – Microcomputers and Microprocessors, PHI/ Pearson Education
7. Chowdhury & Chowdhury, Microprocessor & Perpherals, Scitech
8. Thyagarajan, Microprocessor & Microcontrollers, Scitech
9. Michel Slater – Microprocessor Based Design, PHI
10. Walter A. Tribel – The 8088 and 8086 Microprocessors, PHI
11. Barry B. Brey – The Intel Microprocessors, PHI/Pearson Ed. Asia
12. Mathivanan, Microprocessors PC Hardware & Interfacing, PHI

OPTIMISATION TECHNIQUES

Code: EE-802(b)
Contacts: 3L
Credits: 3

Unconstrained and Constrained minimization of functions. Lagrange multiplier method, Linear programming, simplex method, Duality Dynamic programming, Principles of optimality.

Application to Control and management problems, Miscellaneous topics, sequencing, scheduling and inventory control.

Books:

1. Hadley G: Linear Programming; Pearson Education
2. Vaserstein, Introduction to Linear Programming, Pearson Education
3. Rao B, Optimization Techniques, Scitech
4. Panneerselvam, Operation research, PHI
5. Kalavathy, Operation research,Vikas
6. Hadley G: Non-linear & Dynamic Programming; Pearson Education.
7. Rao S S: Optimisation Theory and Applications - Wiley Eastern Ltd., New Delhi
8. Rao S S: Engineering Optimization (3rd Ed); New Age Int. (P) Ltd.
9. Gottfried B S and Weisman J: Introduction to Optimization Theory; Prentice Hall
10. Mittal K V and Mohan C: Optimization Methods in Operations Research & System Analysis; New Age Int (P) Ltd.
11. Dreyfus S. E - The Art & Theory of Dynamic Programming - Theory & Applications; Academic Press

ADVANCED NUMERICAL COMPUTATION

Code: EE-802(c)
Contacts: 3L
Credits:3

Selected advanced topics in analysis of numerical methods for serial and parallel computers from the following areas: Matrix computation and eigen value problems, System of non-linear equations, Ordinary and partial differential equations.

Books:

1. Iseries and M J D Powel (Eds.) - The state of the art in Numerical Analysis - Oxford University Press, 1987
2. Rajaraman, Computer Aided Numerical Methods, PHI
3. Arumugam, Numerical Methods, Scitech
4. Gerald, Applied Numerical Analysis, Pearson Education
5. Shankara Rao, Numerical Methods, PHI
6. N.Dutta, Computer Oriented Numerical Methods, Vikas
7. D M Young and R T Gregory - A survey of numerical mathematics - Vol-II - Pearson Education
8. D A H Jacobs (Ed.) - The state of the art in numerical mathematics
9. W R Modi - Parallel algorithms and matrix computations - Clarendon Press, Oxford, 1988
10. M J Quinn - Design of efficient - algorithms for parallel computer
11. D J Evans (Ed) - Parallel processing systems, Cambridge University Press, 1982
12. U Schendel - Introduction to numerical methods for parallel computers - Ellis Harwod Ltd., Chichester, 1984.
13. Charistopher, Baks, Philip (Ed.) - The numerical solution of non-linear problems, Clarendon Press, Oxford, 1981.
14. D. Heller - A survey of parallel algorithms in Numerical algebra, SIAM Review 10, 1978.

ENERGY AUDIT & CONSERVATION
Code: EE-802(d)
Contacts: 3L
Credits: 3

Energy resources, renewable and non renewable resources, necessity of conserving energy resources. Alternative sources, energy recycling- Cogeneration. Comparison of various resources in view of capital and running cost, significance of alternative resources, limitations of these resources.

Simple payback period analysis, advantages and limitations of payback period. Time value of money, net present value method. Internal rate of return method, profitability index for cost benefit ratio. Study and selection of proper tariff. Fixed and variable components in tariff.

Concept of energy management- energy inputs in industrial Residential, commercial , agriculture and public sectors- comparison of different energy inputs on the basis of availability, storage feasibility , cost (per unit output) etc. Electrical Energy Management- energy Accounting, Measurement and management of power factor, voltage profile, current energy requirement, power demand monitoring, target setting etc.

Concept of Supply Side Management and Demand Side Management(DSM), Load Management , Voltage profile management from receiving end. Methods of implementing DSM. Advantages of DSM to consumers, utility and society.

Energy audit , a pre-requisite of energy conversion, Principals of energy audit, preliminary energy audit and detailed energy audit. Procedures for carrying out energy audit. Energy- production relationship, specific energy consumption, least square method, Cusum- technique, data energy flow diagram. Sankey diagram. Instruments used for energy audit.

Objectives of energy conservation, planning for energy conservation. Potential for saving electrical energy- in motors, lighting, heating process, cooling system.

Energy conservation in industrial, agricultural, commercial, domestic municipal sectors.

Energy conservation in generation, transmission and distribution. Effective measures to reduce the T&D losses.

Books:-
Electric energy utilization and conservation-   S.C.Tripathy
Energy technology -   S.Rao

Electronics & Electronics Engineering Syllabus

OPTIMAL CONTROL SYSTEMS

Code: 802(e)
Contacts: 3L
Credits: 3

Formulation of optimal control problem: Minimum time, minimum energy, minimum fuel problem, state regulator, output regulator & tracking problems.

Calculus of variations: Constrained fixed point and variable point problems, Euler Lagrange equations.

Problems with equality and inequality constraints. Engineering application, Lagrange, Mayer & Bolza problems, pontryagins Maximum (minimum) principle.

Multiple decision process in discrete and continuous time - The dynamic programming.

Numerical solution of two point boundary value problems - the steepest descent method and the Fletcher - Powell Method.

Books:

1. Athems M & Falb P. L.: Optimal Control; McGraw Hill
2. Tau J.: Modern Control Theory; McGraw Hill
3. Goodwin, Control System Design, Pearson Education/PHI
4. Anderson & Moore, Optimal Control, PHI
5. Glad, Control Theory, Vikas
6. Hestenas M C: Calculus of Variations and Optimal Control. Theory; Wiley.
7. Boltyanskii V G; Gamkrelidge R V; Pontryagin L S; On the theory of Optimal process
8. Bellman R E and Kolaba R E: Dynamic Programming and Modern Control Theory; Academic Press.

Electronics & Electronics Engineering Syllabus

COMMUNICATION ENGG

Code: EC-802(f)
Contacts: 3L
Credits: 3

Linear modulations - AM, DSB, SSB and VSB. Envelope and synchronous detection. Carrier recovery-different loops e.g. PLL etc. Circuits to generate linear modulated signals. Low and high power modulators. Exponential modulation. Frequency and phase modulations. Generation of FM & PM. Radio receivers-superheterodyne principle. AGC, Elements of antenna technology, wave guide and microwave technology.

Noise sources and their characteristics, noise temperature, noise figure and bandwidth. SNR, performance of AM, PM, FM and pulse modulation over different transmission channels.

Channel Capacity, Shannon's Theorem, Nyquist Criterion and Sampling. Pulse modulation types, detection of PAM, PWM & PPM, Pulse generation. Quantisation of analog signals - generation noise. A/D & D/A conversions. PCM, DM, ADM, DPCM, ADPCM for speech signals. Time division and Frequency division multiplexing. Digital modulations: SK, FSK, PSK, DPSK, QPSK & MQAM. Modems. Elements of information theory. Error control and coding Data transmission-synchronization, data protection, error detection and corrections - protocol. Elements of optical communication - optical fibre and sources. Photo-detectors, optical connectors and couplers. Analog and digital transmission using opto - devices.

Elements of satellite communications - tracking and control, launching. Propagation characteristics. Satellite transponders and antennas. Modern trends in communications systems.

Books:

1. B P Lathi, Holt - Modern Digital and Analog Communication System -,OUP
2. G. Kennedy - Electronic communication Systems - TMH
3. R Coolen - Electronic Communication - PHI (1989)
4. Hancock - An introduction to the Principles of Communication Theory - TMH
5. Taub and Schilling - Principles of Communication systems – TMH
6. Roddy, Electronic Communication, Pearson Education/PHI
7. S. Haykin - Communication systems - Pearson Education/PHI
8. Dungan, Electronic Communication Systems, Vikas
9. Carlson - Communication Engg.

REMOTE CONTROL & TELEMETRY

Code: EI - 802(g)
Contacts: 3L
Credits: 3

Introduction : classification of telemetry systems - voltage, current, position, frequency and time. Components of telemetering and remote control systems. Quantization theory - sampling theorem, sample and hold, data conversion-coding.

Multiplexing-time division multiplexers and demultiplexers-theory and circuits, scanning procedure; frequency division multiplexing with constant bandwidth and proportional bandwidth, demultiplexing.

Data acquisition and distribution system. Fundamentals of audio-telemetry system - R.F. links. Telemetry design system. Standard for telemetry e.g. JRIG etc. Microwave links. Pulse code modulation (PCM) techniques. Practical telemetry system - pipe line telemetry, power system telemetry, supervisory telecontrol systems. Introduction to ISDN.

Books:

1. Swobada G - Telecontrol Method and Application of telemetering and remote control - Van Nostrand, 1971.
2. Schwartz M - Information Transmission - Modulation & Noise - MGH, 1970.
3. Gruenberg E L - Handbook of Telemetry and telecontrol - MGH, 67
4. Carley B A - Communication system - Introduction to signals and noise in electrical communications - MGH, Int. student. Edn.
5. D Patranabis - Telemetry principles - Tata McGraw Hill.

COMPUTER COMMUNICATION

Electronics & Electronics Engineering Syllabus

Code: EC-802(h)
Contacts: 3L
Credits: 3

Data transmission principles, transmission components; ASK PSK, FSK, QPSK, O-QPSK, QAM, M-cry digital modulation; data compression; modems principles and their standards; Error control procedures; computer communication, point to point, multidrop, circuit, message and packet switching; components of computer network, hosts, communications channel, terminals, protocols, multiplexers, codes, concentrators etc; fascimile transmission, electronic mail, voce mail, internet working; case study of computer communication networks. Different LAN standards, Wireless LAN. Introduction to Broadband, ATM and ISDN network.

Books:

1. J R Freer - Computer Communication and Network - East West Press, 1990
2. F Halsall - Data Communication Computer Networks and OSS - Pearson Education
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP
4. J Martin - Telecommunication and the Computer 3rd Edn. - PHI, 1992.
5. Miller, Data Network Communication, Vikas
6. A Tanenbaum - Telecommunication Network - Pearson Education /PHI.
7. W Stallings - Data and Computer Communication - Pearson Education/PHI
8. W Stallings - ISDN and introduction - Pearson Education/PHI
9. T Viswanathan - Telecommunication Switching Systems and Networks - PHI, 1992.
10. B G Lee, M Kand & J Lee - Broadband Telecommunication Technology - Artech House, 1993.

AI & NEURAL NETWORKS

Code: CS-802(i)
Contacts: 3L
Credits: 3

Machine Learning & AI - Introduction, hierarchical perspective and foundations. Rote Learning, Learning by advice, Learning in problem solving inductive learning, explanation based learning, learning from observation and discovery, learning by analogy, introduction to formal learning theory.

Biological neurons and brain, models of biological neurons, artificial neurons and neural networks, Early adaptive nets Hopfield nets, back error propagation competitive learning lateral inhibition and feature maps, Stability - Plasticity and noise saturation dilemma, ART nets, cognition and recognition.

Neural nets as massively parallel, connectionist architecture, Application in solving problems from various are as e.g., AI, Computer Hardware, networks, pattern recognition sensing and control etc.

Books:

1. P H Winston - Artificial Intelligence - Pearson Education
2. Bishop, Neural Networks for Pattern Recognition, OUP
3. Cohen, Empirical Methods for AI, PHI
4. Haykin, Neural Network, Pearson Education/PHI
5. E Charniak and W Midermott - Introduction to Artificial Intelligence - Pearson Education.
6. Hagan, Neural Network Design , Vikas
7. Shivanandan, Artificial Neural Network, Vikas
8. Bose - Neural Network Fundamentals with graphs, Algorithms and Applications - TMH.

PROJECT MANAGEMENT & OPERATIONS RESEARCH

Code: M-802(j)
Contacts: 3L
Credits: 3

Project formalities - feasibility study and economic evaluation; UNI DO, OECD and RBI guidelines. Network based project management-graph-theoretic applications. CPM, PERT, GERT and DCPM activities. Scheduling with limited resources, cash scheduling to multi projects situation. Project monitoring and control. Project management under risk and uncertainty.

Operations research-decision-making, development of OR. Linear programming; Formulating of LP models, graphical solution, simples method, duality theory and application. Transportation problem, Assignment problem. Waiting line models; elements of queuing models. Poisson arrival and exponential service time distribution, M/M/I Queue. Finite population models. Queuing art models. Applications. Simulation; modeling, use of random members, flow-chart development, Inventory Control-introduction, costs, deterministic and stochastic models, buffer stocks.

Electronics & Electronics Engineering Syllabus

Books:

1. Hiller - Introduction to Operation Research 6th Edn. - TMH
2. A Ravindran - Introduction to Operation Research - John Wiley, 1993.
3. Panneerselvam, Production & Operations Management,PHI
4. Taha - Operation Research, Pearson Education/PHI
5. Kalavathy, Operation Research, Vikas
6. Patel,Project Management, Vikas
7. Juran - Quality Planning & Analysis 3rd End. - MGH
8. R Kapoor - Computer Assited Decision Models - TMH, 1991
9. P Iyer - Engineering Project Management - Wheeler
10. Adam & Ebert - Production & Operations Management: Concepts, Models and Behaviour 5th Edn. – PHI/ Pearson Education.

ASSIGNED PROJECT

Code: EE-894
Contacts: 12P
Credits: 8

Project work assigned to the students by the teachers or selected by students and approved by teachers on current engineering problems of industrial use.