Syllabus for B.Tech(APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING) Up to Fourth Year

Revised Syllabus of B.Tech AEIE (for the students who were admitted in Academic Session 2010-2011)

COURSE STRUCTURE IN

Third Semester

	A. Theory						
Sl. No.	**Code**	**Paper**	**Contact Hours/Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	**M(CS) 301**	Numerical Methods	2	1	0	3	2
2	**M 302**	Mathematics – III	3	1	0	4	4
3	**EC(EI) 301**	Digital Electronic Circuits	3	0	0	3	3
4	**EC(EI) 302**	Analog Electronic Circuits	3	0	0	3	3
5	**EE(EI) 301**	Circuit Theory and Networks	3	1	0	4	4
6	**EI 301**	Electrical Measurement & Instrumentation	3	1	0	4	4
Total Theory						**21**	**20**
	B. Practical						
7	**M(CS) 391**	Numerical Methods Lab	0	0	2	2	1
8	**EC(EI) 391**	Digital Electronic Circuits Lab	0	0	3	3	2
9	**EC(EI) 392**	Analog Electronic Circuits Lab	0	0	3	3	2
10	**EE(EI) 391**	Circuits and Networks Lab	0	0	3	3	2
Total Practical						**11**	**7**
Total of Semester						**32**	**27**

Fourth Semester

	A. Theory						
Sl. No.	**Code**	**Paper**	**Contact Hours/Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	**HU 401**	Values & Ethics in Profession	3	0	0	3	3
2	**PH(EE) 401**	Physics – II	3	1	0	4	4
3	**CH 401**	Basic Environmental Engineering & Elementary Biology	3	0	0	3	3
4	**EI 401**	Sensors and Transducers	3	1	0	4	4
5	**EI 402**	Microprocessors and Computer Architecture	3	1	0	4	4
6	**EE 402(EI)**	Field theory	3	0	0	3	3
Total Theory						**20**	**21**
	B. Practical						
7	**HU 481**	Technical report writing & language laboratory practice	0	0	3	3	2
8	**PH(EE) 491**	Physics –II Lab	0	0	3	3	2
9	**EI 491**	Electrical Measurement & Instrumentation Lab	0	0	3	3	2
10	**EI 492**	Microprocessor Lab	0	0	3	3	2
Total Practical						**12**	**8**
Total of Semester						**32**	**29**
Total of Year							**56**

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Fifth Semester

	A. Theory							
Sl. No.	**Field**	**Code**	**Paper**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	**HU**	**HU 501**	Economics for Engineers	3	0	0	3	3
2	**PC**	**EI 501**	Industrial Instrumentation	3	1	0	4	4
3	**PC**	**EI 502**	Control Theory	3	1	0	4	4
4	**PE**	**EI 503A / EI 503B**	Optoelectronics & Fibre Optics/ Advanced Sensors/	3	0	0	3	3
5	**FE**	**EI 504A/ EI 504B/ EI 504C**	Data Structures & Algorithms(CS)/ Data Base Management System(CS)/ Software Engineering(IT)	3	0	0	3	3
Total Theory							**17**	**17**
	B. Practical							
6	**PC**	**EI 591**	Industrial Instrumentation Lab	0	0	3	3	2
7	**PC**	**EI 592**	Sensors and Transducers Lab	0	0	3	3	2
8	**PC**	**EI 593(EE)**	Control Engineering Lab	0	0	3	3	2
9	**FE**	**EI 594A / EI 594B / EI 594C**	Data Structures & Algorithms Lab(CS)/ DBMS Lab(CS)/ Software Engineering Lab(IT)	0	0	3	3	2
Total Practical							**12**	**8**
Total of Semester							**29**	**25**

Sixth Semester

	A. Theory							
Sl. No.	**Field**	**Code**	**Paper**	**Contact Hours/Week**				**Credit Points**
				L	**T**	**P**	**Total**	
1	**HU**	**HU 601**	Principles of Management	2	0	0	2	2
2	**PC**	**EI 601**	Process Control-I	3	1	0	4	4
3	**PC**	**EI 602**	Electronic Instrumentation and Measurement	3	1	0	4	4
4	**PC**	**EI 603**	Advanced Microprocessors & Microcontrollers	3	1	0	4	4
5	**PE**	**EI 604A / EI 604B / EI 604C**	Bio Medical Instrumentation/ Soft Computing/ Non Destructive Testing & Ultrasonic Instrumentation	3	0	0	3	3
6	**FE**	**EI 605A / EI 605B/ EI 605C/ EI605D**	Digital Signal Processing(EC)/ Microwave Engineering(EC)/ Antenna Theory & Propagation(EC) Non Conventional Energy Sources	3	0	0	3	3
Total Theory							**20**	**20**
	B. Practical							
7	**PC**	**EI 691**	Process Control Lab	0	0	3	3	2
8	**PC**	**EI 692**	Electronic Instrumentation and Measurement Lab	0	0	3	3	2
9	**PC**	**EI 693**	Advanced Microprocessors & Microcontrollers Lab	0	0	3	3	2
10		**EI 681**	Seminar	0	0	3	3	2
Total Practical							**12**	**8**
Total of Semester							**32**	**28**

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Seventh Semester

Sl. No.	Field	Code	Paper	Contact Hours/Week				Credit Points
				L	T	P	Total	
	A.	**Theory**						
1	**PC**	**EI 701**	Telemetry and Remote Control	3	1	0	4	4
2	**PC**	**EI 702**	Analytical Instrumentation	3	1	0	4	4
3	**PC**	**EI 703**	Process Control-II	3	1	0	4	4
4	**PE**	**EI 704A / EI 704B / EI 704C**	Communication Theory/ Microelectronics & VLSI Technology/ FPGA & Reconfigurable Computing	3	0	0	3	3
5	**FE**	**EI 705A(CS) / EI 705B(IT) / EI 705C(IT)**	Computer Networking/ Multimedia/ Internet Technology	3	0	0	3	3
Total Theory							**18**	**18**
	B.	**Practical**						
6	**PC**	**EI 791**	Telemetry and Remote Control Lab	0	0	3	3	2
7	**PE**	**EI 794A / EI 794B / EI 794C**	Communication Lab/ Microelectronics & VLSI Technology Lab/ FPGA & Reconfigurable Computing Lab	0	0	3	3	2
8	**FE**	**EI 795A(CS) / EI795B(IT) / EI 795C(IT)**	Computer Networking Lab/ Multimedia Lab/ Internet Technology Lab	0	0	3	3	2
9		**EI 781**	Industrial Training Evaluation	**4 wks during 6th -7th Sem-break**				2
10		**EI 792**	Project-1	0	0	6	6	2
Total Practical							**15**	**10**
Total of Semester							**33**	**28**

Eighth Semester

Sl. No.	Field	Code	Paper	Contact Hours/Week				Credit Points
				L	T	P	Total	
	A.	**Theory**						
1	**HSS**	**HU 801A**	Organisational Behavior	2	0	0	2	2
2	**PE**	**EI 801A / EI 801B / EI 801C**	Power Electronics/ Industrial Drives/ Power Plant Instrumentation	3	0	0	3	3
3	**FE**	**EI 802A(EC) / EI 802B(EC) / EI 802C(EC)/ EI 802D(CH)**	Mobile Communication/ Embedded Systems/ Digital Image Processing/ Plant Automation	3	0	0	3	3
Total Theory							**8**	**8**
	B.	**Practical**						
4	**PE**	**EI 891A(EE) / EI 891B(EE) / EI 891C(EE)**	Power Electronics Lab/ Industrial Drives Lab/ Power Plant Instrumentation Lab	0	0	3	3	2
5		**EI 892**	Instrumentation and Control Design Lab	0	0	6	6	4
6		**EI 893**	Project - 2	0	0	12	12	6
7		**EI 894**	**Grand Viva**					3
Total Practical							**21**	**15**
Total of Semester							**29**	**23**

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III SEMESTER

Theory

NUMERICAL METHODS
Code : M(CS) 301
Contacts : 2L+1T
Credits :2

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. (4)

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. (5)

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. (3)

Numerical solution of a system of linear equations:
Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method. (6)

Numerical solution of Algebraic equation:
Bisection method, Regula-Falsi method, Newton-Raphson method. (4)

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method. (6)

Text Books:

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

References:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.

MATHEMATICS

Code: M 302

Contacts: 3L +1T = 4

Credits: 4

Note 1: The entire syllabus has been divided into four modules.
Note 2: Structure of Question Paper
There will be two groups in the paper:

Group A: Ten questions, each of 2 marks, are to be answered out of a total of 15 questions, covering the entire syllabus.

Group B: Five questions, each carrying 10 marks, are to be answered out of (at least) 8 questions.
Students should answer at least one question from each module.
[At least 2 questions should be set from each of Modules II & IV.
At least 1 question should be set from each of Modules I & III. Sufficient questions should be set covering the whole syllabus for alternatives.]

Module I: Fourier Series & Fourier Transform [8L]

Topic: Fourier Series:
Sub-Topics: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave. (1)

Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period 2l, Dirichlet's conditions, Sum of Fourier series. Examples. (1)

Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only). Examples. (2)

Topic: Fourier Transform:
Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. (1)

Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples. Fourier Transform of Derivatives. Examples. (1)

Convolution Theorem (statement only), Inverse of Fourier Transform, Examples. (2)

Module II : Calculus of Complex Variable [13L]

Topic: Introduction to Functions of a Complex Variable.

Sub-Topics: Complex functions, Concept of Limit, Continuity and Differentiability. (1)

Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. (1)

Construction of Analytic functions: Milne Thomson method, related problems**.** (1)

Topic: Complex Integration.

Sub-Topics: Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples. (2)

Cauchy's theorem (statement only). Cauchy-Goursat theorem (statement only). Examples. (1)

Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function. Examples. (2)

Taylor's series, Laurent's series. Examples (1)

Topic: Zeros and Singularities of an Analytic Function & Residue Theorem.

Sub-Topics: Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m.
Examples on determination of singularities and their nature. (1)

Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of definite integrals: $\int_0^{\infty} \frac{\sin x}{x} dx$, $\int_0^{2\pi} \frac{d\theta}{a + b\cos\theta + c\sin\theta}$, $\oint_C \frac{P(z)}{Q(z)} dz$ (elementary cases, P(z) & Q(z) are polynomials of 2nd order or less). (2)

Topic: Introduction to Conformal Mapping.

Sub-Topics: Concept of transformation from z-plane to w-plane. Concept of Conformal Mapping. Idea of some standard transformations. Bilinear Transformation and determination of its fixed point. (1)

Module III: Probability [8L]
Topic: Basic Probability Theory
Sub-Topics: Classical definition and its limitations. Axiomatic definition.
Some elementary deduction: i) $P(O)=0$, ii) $0 \leq P(A) \leq 1$, iii) $P(A')=1-P(A)$ etc. where the symbols have their usual meanings. Frequency interpretation of probability. (1)

Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems. Conditional probability & Independent events. Extension to more than 2 events (pairwise & mutual independence). Multiplication Rule. Examples. Baye's theorem (statement only) and related problems. (3)

Topic: Random Variable & Probability Distributions. Expectation.
Sub-Topics: Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof). Examples. Definitions of Expectation & Variance, properties & examples. (2)

Some important discrete distributions: Binomial & Poisson distributions and related problems.
Some important continuous distributions: Uniform, Exponential, Normal distributions and related problems. Determination of Mean & Variance for Binomial, Poisson & Uniform distributions only. (2)

Module IV: Partial Differential Equation (PDE) and Series solution of Ordinary Differential Equation (ODE) [13L]

Topic: Basic concepts of PDE.
Sub-Topics: Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transform methods. (1)

Topic: Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace & Fourier transform methods.

Sub-Topics:
PDE I: One dimensional Wave equation. (2)
PDE II: One dimensional Heat equation. (2)
PDE III: Two dimensional Laplace equation. (2)

Topic: Introduction to series solution of ODE.

Sub-Topics: Validity of the series solution of an ordinary differential equation.
General method to solve $P_o\, y''+P_1\, y'+P_2\, y=0$ and related problems. (2)
Topic: Bessel's equation.

Sub-Topics: Series solution, Bessel function, recurrence relations of Bessel's Function of first kind. (2)
Topic: Legendre's equation.
Sub-Topics: Series solution, Legendre function, recurrence relations and orthogonality relation. (2)

TOTAL LECTURES : 42

Text Books:

2. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
3. Das N.G.: Statistical Methods, TMH.
4. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
5. James G.: Advanced Modern Engineering Mathematics, Pearson Education.
6. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.

References:

1. Bhamra K. S.: Partial Differential Equations: An introductory treatment with applications, PHI
2. Dutta Debashis: Textbook of Engineering Mathematics, New Age International Publishers.
3. Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
4. Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
5. Ramana B.V.: Higher Engineering Mathematics, TMH.
6. Spiegel M.R. , Lipschutz S., John J.S., and Spellman D., : Complex Variables, TMH.

Digital Electronic Circuits
Code : EC(EI) 301
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Data and number systems; Binary, Octal and Hexadecimal representation and their conversions; BCD,ASCII, EBDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic.	4
Boolean algebra; Various Logic gates- their truth tables and circuits; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, K-map method and Quine-McClauskey method	4
Module II	
Combinational circuits- Adder and Subtractor circuits; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator.	5
Memory Systems: RAM, ROM, EPROM, EEROM	4
Module III	
Sequential Circuits- Basic memory element-S-R, J-K, D and T Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology.	5
Different types of A/D and D/A conversion techniques.	4
Logic families- TTL, ECL, MOS and CMOS, their operation and specifications.	4
	30

Text Books:

1. A.Anand Kumar, Fundamentals of Digital Circuits- PHI
2. A.K.Maini- Digital Electronics- Wiley-India
3. Kharate- Digital Electronics- Oxford

Reference Books:

1. Morries Mano- Digital Logic Design- PHI
2. R.P.Jain—Modern Digital Electronics, 2/e , Mc Graw Hill

3. H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill.
4. D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
5. Givone—Digital Principles & Design, Mc Graw Hill
6. Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
7. S.K.Mandal, Digital Electronics Principles and Applications- Mc Graw Hill.
4. J.Bignell & R.Donovan-Digital Electronics-5/e- Cenage Learning.
8. Leach & Malvino—Digital Principles & Application, 5/e, Mc Graw Hill
9. Floyed & Jain- Digital Fundamentals-Pearson.
10. P.Raja- Digital Electronics- Scitech Publications
11. S.Aligahanan, S.Aribazhagan, Digital Circuit & Design- Bikas Publishing

ANALOG ELECTRONIC CIRCUITS
Code : EC(EI) 302
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Filters and Regulators: Capacitor filter, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation, 78xx and 79xx series, concept of SMPS.	4
Transistor Biasing and Stability: Q-point, Self Bias-CE, Compensation techniques, h-model of transistors. Expression for voltage gain, current gain, input and output impedance, trans-resistance & trans-conductance; Emitter follower circuits, High frequency model of transistors.	5
Module II	
Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band amplifier.	5
Feedback Amplifiers & Oscillators: Feedback concept, negative & positive feedback, voltage/current, series/shunt feedback, Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators.	4
Module III	
Operational Amplifier: Ideal OPAMP, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback loop (positive & negative), inverting & non-inverting amplifiers, voltage follower/buffer circuit.	5
Applications of Operational Amplifiers: adder, integrator & differentiator, comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running oscillator.	5
Multivibrator – Monostable, Bistable, Astable multivibrators; Monostable and astable operation using 555 timer.	2
	30

Text Books:

1. Sedra & Smith-Microelectronic Circuits- Oxford UP
2. Franco—Design with Operational Amplifiers & Analog Integrated Circuits , 3/e, McGraw Hill
3. Boylested & Nashelsky- Electronic Devices and Circuit Theory- Pearson/PHI

Reference Books:

1. Millman & Halkias – Integrated El;ectronics, McGraw Hill.
2. Rashid-Microelectronic Circuits-Analysis and Design- Thomson (Cenage Learning)
3. Schilling & Belove—Electronic Circuit:Discrete & Integrated , 3/e , McGraw Hill
4. Razavi- Fundamentals of Microelectronic s- Wiley
5. Malvino—Electronic Principles , 6/e , McGraw Hill
6. Horowitz & Hill- The Art of Electronics; Cambridge University Press.
7. Bell- Operational Amplifiers and Linear ICs- Oxford UP
8. Tobey & Grame – Operational Amplifier: Design and Applications, Mc GrawHill.
9. Gayakwad R.A -- OpAmps and Linear IC's, PHI
10. Coughlin and Driscol – Operational Amplifier and Linear Integrated Circuits – Pearson Education

CIRCUIT THEORY AND NETWORKS
Code : EE(EI) 301
Contacts : 3L +1T
Credits : 4

Topic	No. of periods
Module I	
Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.	3
Coupled circuits: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems.	3
Resonant Circuits: Series and Parallel Resonance, Impedance and Admittance Characteristics, Quality Factor, Half-Power Points, Bandwidth, Resonant voltage rise, Transform diagrams, Solution of Problems	4
Module II	
Laplace transforms: Concept of complex frequency, transformation of step, exponential, overdamped surge, critically damped surge, damped sine, undamped sine functions, properties of Laplace Transform, linearity, real-differentiation, realintegration, Initial Value Theorem and Final Value Theorem, Inverse Laplace Transform, applications in circuit analysis, Partial Fractions expansion, Heaviside's Expansion Theorem, Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Transient analysis of different electrical circuits with and without initial conditions. Concept of Convolution theorem and its application. Solution of Problems with DC & AC sources.	10
Module III	
Network equations: Kirchoff's Voltage Law & Current Law, Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem. Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources.	6

Graph of Network: Concept of Tree, Branch, Tree link, junctions, Incident matrix, Tie-set matrix and loop currents, Cut-set matrix and node pair potentials, duality, solution of problems.	4

Module IV

Two port networks analysis: Open circuit Impedance & Short circuit Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance. Solution of Problems with DC & AC sources.	4
Circuit Transients: DC Transient in R-L & R-C circuits with and without initial charge, R-L-C circuits, AC transients in sinusoidal R-L, R-C, & R-L-C circuits, solution of problems	4
Filter Circuits: Analysis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems	2
	40

Books:

1. Network Analysis, M.E.Van Valkenburg (Prentice Hall)
2. Engineering Circuit Analysis, W.H.Hayt, J.E.Kenmerly, S.M.Durbin,(TMH)
3. Network and Systems, Ashfaq Husain,(Khanna Book Publisher)
4. Network and Systems, D.Roychowdhury,(New Age International)
5. Modern Netwok Analysis, F.M.Reza & S.Seely, McGraw Hill.

Electrical Measurements and Instruments
Code : EI 301
Contacts : 3L+1T
Credits : 4

Topic	No. of periods

Module I

General features – Construction and principle of operation of moving coil, moving iron, Dynamometer, Thermal, Rectifier and Electrostatic type instruments. Deflecting, controlling and damping torques, extension of instrument ranges using shunts, multipliers and instrument transformers.	12

Module II

Static and Dynamic errors: Standard inputs and system analysis for evaluation of such errors. Definitions of precision, hysteresis, nonlinearity, sensitivity, speed of response, fidelity.	2
Statistical error analysis, mean, median, mode, average, estimates, distribution, probable error, standard deviation, test of normal distribution, chi-squared test curve fitting (a) method of sequential differences (b) method of extended differences and (c) method of least squares	4
Reliability: definition on the basis of Gaussian and normal distribution function, MTTF, Bath Tub curve, operating life and cumulative failure analysis.	3

Module III

Measurement of low, medium and high resistances, Kelvins double bridge, multimeters, megger.	5
Measurement of inductances, capacitance and frequency by A.C. Bridges – Maxwell, Schering, Anderson, De-Sauty, Wien.	5

Module IV

Localization of cable faults using Murray and Varley loop methods. D.C. and A.C. potentiometers, Measurement of high voltage.	6
A.C. and D.C. energy meters.	3
	40

Books:

1. Golding E.W. & Wides F.C. : Electrical Measuring Instruments & Measurements ; Wheeler
2. Harris, F. K. – Electrical Measurements, Wiley.
3. Sawhney A K : A course in Electrical & Electronic Measurements & Instruments, Dhanpat Rai & Co.
4. Reissland M.U.: Electrical Measurement, New Age International

Practical

NUMERICAL METHODS
Code : M(CS) 391
Credits :1

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runga-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

Digital Electronic Circuits Lab

Code : EC(EI) 391
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.

ANALOG ELECTRONIC CIRCUITS LAB
Code : EC(EI) 392
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 its 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 Phase Locked Loop using Voltage Controlled Oscillator (VCO).
11. Study of D.A.C & A.D.C.

Circuits and Networks Lab

Code : EE(EI) 391
Contacts : 3P
Credits : 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

IV SEMESTER

Theory

VALUES & ETHICS IN PROFESSION

HU-401
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.

PH (EE)-401 :PhysicsII
Contacts : 3L + 1T
Credits : 4

Topic	No of periods
Module-I	
Quantum mechanics: • Generalized co-ordinates, Lagrange's equation of motion and Lagrangian, generalized force potential, moment and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion. • Concept of probability and probability density, operator, Commutator, Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function Ψ(normalization and probability interpretation), Expectation values, Application of Schrödinger equation-Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels.	6 10
Module-II	
Statistical mechanics: • Concept of energy levels and energy states. Microstates, Macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (no deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics. Fermi distribution at zero and non –zero temperature.	4
Module-III	

Dielectric Properties: • Dielectric Material: Concept of Polarization, the relation between D, E and P, Polarizability, Electronic, Ionic, Orientation & Space charge polarization, behavior of Dielectric under alternating field, Dielectric losses.	3
The Magnetic properties: • Magnetization M, relation between B, H & M. Bohr megneton, Diamagnetism-Larmor frequency & susceptibility, Curie law, Weiss molecular field theory & Curie-Weiss law, Hysteresis loss, Antiferromagnetism, Ferromagnetism & Ferrites (analitative).	4

Module-IV

Crystal structure • Crystal structure- Bravais lattice, Miller indices • Crystal diffraction (qualitative), Bragg's law and reciprocal lattice,Brillouin zone. (Qualitative description) • Free electron theory of metal – calculation of Fermi energy, density of states. • Band theory of solids- Bloch theorem, Kronig Penny model. • Electronic conduction in solids-Drude's theory, Boltzmann equation, Wiedemann Frantz law. • Semiconductor-Band structure, concept of electron and holes, Fermi level, density of states.	1 2 2 3 3 3

Text Books:

1. Perspectives of Modern Physics: A. Baiser
2. Modern Physics and Quantum Mechanics E.E. Anderson
2. Refresher course in B.Sc. Physics (Vol. III): C.L. Arora
3. Fundamentlas of Physics (Vol. III): Haliday, Resnick & Krane
4. Engineering Physics: R.K. Kar
5. Classical Mechanics: a) A.K. Roychaudhuri
   b) R.G. Takwal & P.S. Puranic
6. Quantum Mechanics: a) Eisberg & Resnic
   b) A.K. Ghatak & S. Lokanathan
   c) S.N. Ghoshal
7. Statistical Mechanics and Thermal Physics: a) Sears and Salinger
   b) Avijit Lahiri
   c) Evelyn Guha
8. Solid Sate Physics: a) A.J. Dekker
   b) C. Kittel
   c) Aschroft & Mermin
   d) S.O. Pillai

CH401: Basic Environmental Engineering & Elementary Biology

Contacts : 3L

Credits : 3

General

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

1L

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.

2L

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. 1L

Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

2L

Ecology

Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. 1L

Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. 2L

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. 1L

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity. 2L

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. 1L

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. 1L

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. 1L

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). 2L

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. 2L

Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.

Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. 2L

Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification. 1L

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

1L

Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water.

Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. 2L

River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH.

2L

Lake: Eutrophication [Definition, source and effect]. 1L

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) 1L

Standard and control: Waste water standard [BOD, COD, Oil, Grease],

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.

2L

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

1L

Land Pollution

Lithosphere; Internal structure of earth, rock and soil 1L

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling.

Solid waste management and control (hazardous and biomedical waste). 2L

Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] 1L

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, $L_{10}(18\,\text{hr Index})$, Ld_n.

Noise pollution control. 1L

Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L

References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

Sensors and Transducers
Code : EI401
Contacts : 3L+1T
Credits : 4

Topic	No. of periods
Module I	
Definition, principles of sensing and transduction, classification	1
Mechanical and Electromechanical sensors ▪ Resistive (potentiometric) type: Forms, materials, resolution, accuracy, sensitivity ▪ Strain Gauges: theory, types, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesives, rosettes, applications- force, velocity and torque measurements ▪ Inductive sensors: common types- reluctance change type, mutual inductance change type, transformer action type, - brief discussion with respect to materials, construction and input output variables, Ferromagnetic plunger type-short analysis; proximity measurement ▪ LVDT: Construction, materials, output-input relationship, I/O curve, discussion	2 3 3 2
Module II	
Capacitive sensors: Variable distance- parallel plate type, Variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type: calculation of sensitivities; proximity measurement Stretched Diaphragm type: microphones, response characteristics	3 1
Piezoelectric elements: piezoelectric effects, charge and voltage coefficients, crystal model, materials, natural and synthetic types – their comparison, force and stress sensing, piezoelectric accelerometer	3
Tachometers – Stroboscopes, Encoders, seismic accelerometer, Measurement of vibration.	3
Module III	
Industrial weighing systems : Link–lever mechanism, Load cells – pneumatic, piezo-electric, elastic and magneto-elastic types - their mounting, pressductor, different designs of weighing systems, conveyors type, weighfeeder type.	5
Thermal sensors: Resistance change type: RTD - materials, construction, types, working principle Thermister - materials, construction, types, working principle Thermoemf sensors: Thermocouple - types, working principle Thermopile - types, working principle	6
Module IV	
Magnetic sensors: Sensors based on Villari effect for assessment of force, torque, rpm meters, proximity measurement Hall effect and Hall drive, performance characteristics	4
Geiger counters, Scintillation detectors	2
Introduction to Smart sensors	2

	40

Books:

1. D Patranabis, Sensors and Transducers, PHI, 2nd ed.
2. E. A. Doebelin, Measurement Systems: Application and Design
   Mc Graw Hill, New York
3. H. K. P. Neubert, Instrument Transducers, Oxford University Press, London and Calcutta

MICROPROCESSORS AND COMPUTER ARCHITECTURE

Code: EI402
Contacts: 3L+1T
Credits: 4

Topic	*No. of Periods*
Module I: Introduction to microprocessors: Overview of 8085, Internal architecture, Pin Diagram description. Software instruction set and Assembly Language Programming. Addressing Modes.	10
Module II: Instruction cycle, machine cycle, Timing diagrams. Interrupts: Introduction, Interrupt vector table, Interrupt service routine, Design of programs using interrupts. DMA operation. Stack and Stack Handling, Call and subroutine, Counter and Time delay generation.	10
Module III: Hardware Interfacing: Interfacing memory, Interfacing I/O devices. Programmable peripheral devices (PPI) – Intel 8255, Programmable interval timer – Intel 8254, Programmable Keyboard/Display Controller- Intel 8279, A/D and D/A converters and interfacing of the same.	12
Module IV: General organization of a digital computer, Architecture classification, Parallel computers-classification, Harvard architecture, Von Neumann architecture, Pipelining, pipeline hazards, Multiprocessors, Array processors.	8
	40

Books:

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. Fundamental of Microprocessor and Microcontrollers, Dhanpat Rai Publications, By B.Ram
4. Computer Architecture & Organization, McGraw Hill, by J.P.Hayes.
5. Computer System Architecture, Pearson, by M. Mano.
6. Computer Architecture – A Quantitative Approach, John Hennessy and David A Patterson.

Field Theory
Code : EE402(EI)
Contacts : 3L
Credits : 3

Topic	**No. of periods**

Module I

Vector calculus – orthogonal Coordinate Systems, Transformations of coordinate systems; Del operator; Gradient, Divergence, Curl – their physical interpretations; Laplacian operator.	4
Coulomb's law, electric field intensity, charge distribution.; Gauss' law, flux density and electric field intensity. Divergence theorem. Current Densities, Conductors, Poisson's & Laplace's equations, Uniqueness theorem, Biot-Savart law, Ampere's law, Relation between J & H, Vector magnetic Potential, Stokes' theorem.	6

Module II

Faraday's law & Lenz's law, Displacement Current, J C – J D Relation, Maxwell's equations, Timeharmonic fields, Wave Equation, Boundary Conditions between media interface; Uniform Plane wave; Wave Propagation in Lossy Dielectric, Loss-less Dielectric, Free space. Poynting Theorem, Power flow, Poynting vector. Wave polarizations.	9

Module III

Transmission Lines: Concept of Lump parameters and Distributed parameters, Line Parameters, Transmission line equations and solutions, Physical significance of the solutions. Propagation constant, Characteristic Impedance; Wavelength; Velocity of Propagation; Distortion-less Line, Reflection and Transmission coefficients; Standing Waves, VSWR, Input Impedance, Load Matching Techniques.	9
	28

Books:

4. Principles of Electromagnetics, 4th Edition, Matthew O H Sadiku, Oxford University Press.
5. Engineering Electromagnetics, 7thEdition-W.H.Hayt & J.A.Buck, Tata-McGraw-Hill
6. Theory and problems of Electromagnetic, Edminister, 2nd Edition, Tata-McGraw-Hill
7. Electromagnetic Field Theory & Transmission Lines, G.S.N. Raju, Pearson Education
8. Electromagnetic field theory fundamentals, Guru & Hizroglu, 2nd edition, Cambridge University Press.
9. Engineering Electromagnetics, 2ed Edition - Nathan Ida, Springer India
10. Elements of Engineering Electromagnetic, N.N. Rao, 6th Edition, Pearson Education.
11. Electromagnetic Waves and Transmission Lines- by G.Prasad, J.Prasad and J.Reddy- Scitech

Practical

PAPER NAME : TECHNICAL REPORT WRITING & LANGUAGE LABORATORY PRACTICE
PAPER CODE: HU 481
CONTACT: 1L+2P
CREDIT : 2

Guidelines for Course Execution:

Objectives of this Course: This course has been designed:

1. **To inculcate a sense of confidence in the students.**
2. **To help them become good communicators both socially and professionally.**
3. **To assist them to enhance their power of Technical Communication.**

Detailed Course Outlines:

A. ***Technical Report Writing*** : 2L+6P

1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

B. ***Language Laboratory Practice***

I. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory

Practice Sessions 2L

2. Conversation Practice Sessions: (To be done as real life interactions) 2L+4P

a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed

b) Introducing Role Play & honing over all Communicative Competence

3. Group Discussion Sessions: 2L+6P

a) Teaching Strategies of Group Discussion

b) Introducing Different Models & Topics of Group Discussion

c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure

Interview Sessions; 2L+6P

- ***a) Training students to face Job Interviews confidently and successfully***
- ***b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication***

4. Presentation: 2L+6P

- ***a) Teaching Presentation as a skill***
- ***b) Strategies and Standard Practices of Individual /Group Presentation***
- ***c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids***

5. Competitive Examination: 2L+2P

- ***a) Making the students aware of Provincial /National/International Competitive Examinations***
- ***b) Strategies/Tactics for success in Competitive Examinations***
- ***c) SWOT Analysis and its Application in fixing Target***

Books – Recommended:

Nira Konar: English Language Laboratory: A Comprehensive Manual
PHI Learning, 2011

D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing
Pearson Education (W.B. edition), 2011

References:

Adrian Duff et. al. (ed.): Cambridge Skills for Fluency

- ***A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)***
- ***B) Listening (Levels 1-4 Audio Cassettes/Handbooks)***

Cambridge University Press 1998

Mark Hancock: English Pronunciation in Use
4 Audio Cassettes/CD'S OUP 2004

Physics Lab-2
Code: PH(EE)-491
Contacts: (3P)
Credit: (2)

1. Determination of dielectric constant of a given dielectric material.
2. Determination of thermo electric power at a certain temperature of a given thermocouple.
3. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
4. Determination of Planck constant using photocell.
5. Determination of Lande'g factor using Electron spin resonance spectrometer.
6. Determination of Stefen's radiation constant.
7. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
8. Determination of Rydberg constant by studying Hydrogen –Helium spectrum.
9. Determination of Hall coefficient of semiconductor.

10. Determination of Band gap of semiconductor.
11. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Electrical Measurement & Instrumentation Lab

Code : EI 491
Contacts : 3P
Credits : 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/voltmeter 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 Inductance by Anderson Bridge
8. Measurement of Capacitance by De Sauty Bridge

Microprocessor Lab
Code : EI 492
Contacts : 3P
Credits : 2

Sl. No.	NAME OF THE EXPERIMENTS
1.	a)Familiarization with 8085 trainer kit components. b) Familiarization with 8085 simulator on PC.
2.	a) Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. b) Assignments based on above
3.	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
4.	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
5.	Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding
6.	INTERFACING WITH I/O MODULES: a) ADC b) Speed control of mini DC motor using DAC

c) Stepper motor

7. FAMILIARIZATION WITH EPROM PROGRAMMING AND ERASING

SEMESTER – V
Theory

Economics for Engineers
HU-501
Contracts: 3L
Credits- 3

1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.
3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value Of Money, Debt repayment, Nominal & Effective Interest.
4. Present Worth Analysis : End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
5. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate Of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.
6: Uncertainty In Future Events - Estimates And Their Use In Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.
7. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.
8. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life Of A New Asset, Marginal Cost, Minimum Cost Life Problems.
9. Inflation And Price Change – Definition, Effects, Causes, Price Change With Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

Readings

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

INDUSTRIAL INSTRUMENTATION
Code : EI 501
Contacts : 3L+1T
Credits : 4

(All periods will be of at least 50 minutes duration)

Topic	No. of periods
Module I	
Measurement of Pressure and Vacuum: Pressure: Manometers – U tube, Inclined Tube and Well type Manometers Elastic Pressure Sensor Instruments – Bourdon Tube Pressure Gauge, Capsule Gauge, Differential Pressure Gauge, Pressure Switch Electronic Pr / DP transmitters : capacitive, piezo - resistive and resonating wire type Vacuum: Mcleod Gauge, thermal conductivity gauge, ionization gauge	**6**
Module II	
Flow rate Measurement: General concepts - Laminar flow, Reynolds's number, Effect of temperature and pressure on flow rate measurement, Calibration of flow meters. Head type flow measurement – analysis and calculation, and head producing devices - orifice, venturi, pitot tube, multiport averaging pitot Variable Area Flowmeters – Glass and metal tube rotameters	**11**

Electromagnetic type, Ultrasonic type, Vortex type, Positive displacement type Mass flow meters : Coriolis, Thermal, Impeller type Weirs, Flumes and open channel flow measurement.	

Module III

Level Measurement : Gauge glass, Bi-Colour, Magnetic and Reflex Level Gauge Float and displacers type instruments – Gauge and Switch D/P type sensors and their installation arrangements Capacitive type level instrument Ultrasonic and Microwave type level instruments	**6**

Module IV

Temperature Measurement: Temperature scale, ITS 90, fixed points and interpolation equations Filled in systems: liquid, gas and vapour, ranges, media, errors, construction details and comparison, classification Bimetal elements, Thermostats RTD: review of materials, construction, types; measuring circuits, ranges, errors and minimization of errors Thermocouples including MI thermocouples: types, thermoelectric power, circuits, ranges, errors, cold junction compensation, compensating cables Radiation Thermometer sensors used, spectral and other characteristics, Optical Pyrometers	**8**

Topic	**No. of periods**

Module V

Installation Requirements Installation of pressure measuring instruments with accessories like seals, snubbers, 2 valve manifolds Installation of DP measuring instruments with head producing devices – pressure tappings, isolation valves, 3 valve manifolds, etc. Straight run requirements for flowmeters Installation of Temp elememts – Thermowells	**3**
Pneumatic Instrumentation Flapper nozzle system - pneumatic force balance and motion balance system Pneumatic Transmitter	**2**
Hazardous Area Instrumentation (May be reduced) Basic Concepts Classification based on site, material and temperature – IEC and North American system Methods of Protection – Explosion proof, Intrinsic safety, Purging and Pressurization, Non-Incendiary ; IEC Equipment Protection Level (EPL) NEMA and IP codes	**4**
	40

Books:

1. D. Patranabis, Principles of industrial Instrumentation, TMH, New Delhi, 2nd Ed.
2. B. G. Liptak, Instrument Engineers Handbook, vol-I and vol-II, Chilton Book Co. Philadelphia
3. D. M. Considine and G. D. Considine (Eds.) Process Instruments and controls Handbook, Mc Graw Hill, New York
4. Ernest O. Doeblin, Measurement Systems – Application and Design, Tata-McGraw Hill
5. A. Barua, Fundamentals of Industrial Instrumentation, Wiley India
6. M.M.S. Anand, Electronic Instruments and Instrumentation Technology, PHI, Delhi
7. C. R. Alavala, Principles of Industrial Instrumentation and Control Systems, Cengage Learning

CONTROL THEORY
Code : EI 502 (EE)
Contacts : 3L+1T
Credits : 4

Topic	**No. of periods**
Module I	
Elementary control concepts. Open loop and close loop control	1
Mathematical Model of Physical Systems: Introduction, Differential equation representation of physical systems, Transfer function concepts, Block diagram algebra, Signal flow graphs	3
Feedback Characteristics of Control Systems: Introduction, Reduction of parameter variation by use of feedback, Control of system dynamics by use of feedback.	1
Control System Components: Introduction, DC servomotors, DC tacho-generators, AC servomotors, AC tacho-generators, Stepper motors, Synchro error detectors, Areas of Application.	3
Time Response Analysis: Introduction, Standard test signals, Performance indices, Time response of first	5

order system, Time response of second order systems, Design specifications of second order systems.	

Module II

Stability Analysis in Time Domain: The concept of stability, Assessment of stability from pole positions, Necessary conditions for stability, Routh Stability Criterion, Relative stability analysis, Illustrative examples.	4
Root Locus Technique : Introduction, The root locus concept, Root locus construction rules, Root contours, Case studies.	4

Module III

Frequency Response Analysis: Introduction, Performance indices, Frequency response of second order systems, Polar plots, Bode plots, All pass systems, Minimum-phase and Non-minimum-phase systems, Assessment of relative stability – Gain Margin and Phase Margin,Illustrative examples.	6
Stability Analysis in Frequency Domain: Introduction, A brief review of Principle of Argument, Nyquist stability criterion, Illustrative examples.	4

Module IV

Concepts of state, state variables and state model, State models of linear continuous-time systems, Concept on Controllability and Observability, Illustrative examples.	3
Introduction to Design: The design problem, Concepts of cascade and feedback compensation, Realization of basic compensators, Case studies.	4
Introduction to PID Control (Grass-root concept only)	2
	40

Books :

1. Nagrath I. J. and Gopal M.,"Control Systems Engineering", New Age International (P) Ltd.
2. Ogata K, "Modern Control Systems", Prentice Hall, Englewood Cliffs.
3. Benjamin C. Kuo, "Automatic Control Systems", PHI
4. Gopal: Modern Control System, New Age International

(All periods will be of at least 50 minutes duration)

OPTOELECTRONICS AND FIBRE OPTICS
Code : EI 503A
Contacts : 3L
Credits : 3

Topic	No. of periods

Module I

Optoelectronics : Characteristics of optical emission, electro-luminescence. LED: Power and efficiency calculation, Structure of LED and its characteristics, Heterojunction LED	4
Laser: semiconductor based lasers - double heterojunction broad area laser, stripe geometry DH laser,.	2

Module II

Photo diode: PIN photodiode, hetero junction diode, Avalanche Photo diode, Phototransistor. LDR, photovoltaic cells, photo emissive cells - types, materials, construction, response, opto-couplers – characteristics, noise figures, applications in analogue and digital devices.	3 6

Module III

Fiber optics: Optical fibre – materials, construction, step index and graded index fibres, ray propagation, attenuation. Modes in optical fibres, intermodal dispersion.	3
singlemode fibre- working principle, attenuation, dispersion and bandwidth. Multimode fibre- attenuation, dispersion. propagation of EM waves, fibre coupling.	5

Module IV

Fibre-optic sensors: classification. Intensity modulated sensors, phase modulated sensors, spectrally modulated sensors.	3
Fibre optic sensors for Industrial applications: temperature, displacement, pressure and liquid-level sensors.	4
Total	30

Books:

1. P. Bhattacharjee, Semiconductor Optoelectronic Devices, PHI
2. W. Hawkes, Optoelectronics- An Introduction, PHI
3. C. K. Sarkar, Optoelectronics and Fiberoptics communication, New Age International
4. John M. Senior, Optical Fibre Communications, PHI
5. Culshaw B. and Dakin J(Ed) - Optical Fibre Sensors, Vol.1.2 Artech House, 1989.
6. Chin-Lin-Chon -Elements of Optoelectronic & Fibre Option, MGH

(All periods will be of at least 50 minutes duration)

ADVANCED SENSORS
Code : EI 503B
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Principle of physical and chemical transduction; sensors classification, characterization of mechanical, electrical, optical, thermal, magnetic, chemical and biological sensors; their calibration and determination of characteristics;	3
Sensor reliability, reliability models and testing, ageing tests, failure mechanisms and their evaluation, stability studies:	2
Module II	
IC technology used in micro sensor system; Crystal growth and wafer making, oxidation lithography, masking, pattern generation and transfer, different types of etching, ion implantation and diffusion, and vacuum evaporation, assembling, packaging, micromachining, epitaxy, use of polysilicon materials, bonding of different types etc.	7
Sensor designing and packaging: Partitioning, Layout, Technology constraints, scaling, compatibility study. Examples of selected micro sensors	4
Thick Film process of sensor development, thin film techniques, Characterization and delineation, Langaur-Blodgett films, sensors developed using these techniques such as gas and ion sensors	4
Ceramics and oxides as sensor materials, materials like Zirconia, Alumina, semiconductors, oxides of Tin & Zinc, Piezoelectric, Pyroelectric, Ferro electric materials.	3
Module III	
Sensors for different applications: Mechanical, Electrical, Thermal, Magnetic, Optical, radiation chemical and Biological types.	3
Smart sensors, methods of internal compensation, information coding, integrated sensor principles, present trends.	4
	30

Book:

1. Triethy HL - Transducers in Electronic and Meachanical Design, Mercel Dekker 1986
2. D. Patranabis – Sensor and Transducers (2e) Prentice Hall, New Delhi, 2003
3. Silicon Sensors – Middlehoek S and Audel S. A. – Academic Press, London 1989
4. Chemical Sensors – Edmonds T. E. (Ed); Blackie – London, 1988
5. Problems and possibilities of oxidic and organic semiconductor gas sensors, G. Heiland and D. Kohl, Sensors and Actuators, Volume 8, Issue 3, November 1985, Pages 227-233.
6. Thick-film sensors: an overview, Maria Prudenziati and Bruno Morten, Sensors and Actuators, Volume 10, Issues 1–2, 10 September 1986, Pages 65-82.
7. The use of polymer materials as sensitive elements in physical and chemical sensors, F.J. Gutierrez Monreal, Claudio M. Mari, Sensors and Actuators, Volume 12, Issue 2, August–September 1987, Pages 129-144.

(All periods will be of at least 50 minutes duration)

SOFT COMPUTING
Code : EI 604B
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Introduction to Soft-computing, Its Constituent components	2
Fuzzy Sets, General Idea and importance in practical life, definition	3
Basic Operators, T- Norms, S- Norms, other aggregation operators	2
Fuzzy relations, implications, extensions, projections and compositions	2
Module II	
Approximate reasoning, compositional rule of inference, rule based systems, term set	3
Fuzzification, reasoning, defuzzification	2
Different Fuzzy models (MA/TS), Applications of Fuzzy rule based systems	4
Module III	
Basics of Genetic Algorithm, its adaptation for computing, Application	6
Studies of some Fuzzy-neural, Neuro-fuzzy and Fuzzy-GA systems	6
	30

Books:

1. Dirankov and Hellendrom Fuzzy logic control, Narosa
2. Rajsekhar and Pai, Neural Networks, Fuzzy logic and Genetic Algorithm: Synthetic and Applications, Pearson Education

3. Goldberg - Genetic algorithm, Pearson 2003
4. Freeman - Neural Networks, Pearson 2003
5. Jang - Neuro-fuzzy and soft Computing, Pearson 2003

Data Structures & Algorithms
Code : EI 504A(CSE)
Contacts : 3L
Credits : 3

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, Quick Sort, Merge Sort, Heap sort 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 book :

1. Data Structures and Algorithms – O.G. Kakde & U.A. Deshpandey, ISTE/EXCEL BOOKS
2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., “Data Structures and Algorithms”, Addison Wesley
3. Drozdek- Data Structures and Algorithms,Vikas

References :

1.Heileman:data structure algorithims &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’ ”
6 Ajay Agarwal: Data structure Through C.Cybertech

Data Base Management System
Code :EI 504B(CSE)
Contacts : 3L
Credits : 3

Introduction [4L]
Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model [6L]
Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Relational Model [5L]
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications Of the Database.

SQL and Integrity Constraints [8L]
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

Relational Database Design [9L]
Functional Dependency, Different anamolies in designing a Database., Normalization using funtional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Nomalization using multi-valued depedencies, 4NF, 5NF

Internals of RDBMS [7L]

Physical data structures, Query optimization : join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management : transaction model properties, state serializability, lock base protocols, two phase locking.

File Organization & Index Structures [6L]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, "Transaction Processing : Concepts and Techniques", Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., "Introduction to Database Management", Vol. I, II, III, Addison Wesley.
7. Ullman JD., "Principles of Database Systems", Galgottia Publication.

Reference:

1. James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi
2. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
3. "Database Management Systems", Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

Software Engineering
Code :EI 504C(CSE)
Contacts : 3L
Credits : 3

Module I

Overview of System Analysis & Design , Business System Concept, System Development Life Cycle, Waterfall Model , Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model. **[10L]**

Module II

System Requirement Specification – DFD, Data Dictionary, ER diagram, Process Organization & Interactions. **[5L]**

System Design – Problem Partitioning, Top-Down And Bottop-Up design ;Decision tree, decision table and structured English; Functional vs. Object- Oriented approach. **[5L]**

Module III

Coding & Documentation - Structured Programming, OO Programming, Information Hiding, Reuse, System Documentation. **[4L]**

Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment . , Validation & Verification Metrics, Monitoring & Control. **[8L]**

Module IV

Software Project Management – Project Scheduling , Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. **[7L]**

CASE TOOLS : Concepts, use and application. **[5L]**
Books:

Text:

1. R. G. Pressman – Software Engineering, TMH
2. Behforooz, Software Engineering Fundamentals,OUP
3. Ghezzi, Software Engineering, PHI
4. Pankaj Jalote – An Integrated Approach to Software Engineering, NAROSA.
5. Object Oriented & Classical Software Engineering(Fifth Edition), SCHACH,TMH
6. Vans Vlet, Software Engineering, SPD
7. Uma, Essentials of Software Engineering, Jaico
8. Sommerville, Ian – Software Engineering, Pearson Education
9. Benmenachen, Software Quality, Vikas

Reference:

1. IEEE Standards on Software Engineering.
2. Kane, Software Defect Prevention, SPD

Practical

INDUSTRIAL INSTRUMENTATION LAB

Code : EI 591
Contacts : 3P
Credits : 2

1. Calibration of Pressure Gauge using Dead Weight Tester.
2. Study of Thermocouple characteristics and Measurement of Temperature with it.
3. Study of RTD characteristics and Measurement of Temperature with it.
4. Measurements of flow rate and velocity of fluid flow by head type flow meter.
5. Measurements of flow rate and velocity of fluid flow by Variable Area type flow meter.
6. Measurement of level using capacitive type level instrument.
7. Measurement of moisture using moisture analyser
8. Measurement of viscosity

SENSORS AND TRANSDUCERS LAB

Code : EI 592
Contacts : 3P
Credits : 2

1. Temperature measurement using AD590 IC sensor.
2. Displacement measurement by using a capacitive transducer.
3. Pressure and displacement measurement by using LVDT.
4. Study of a load cell with tensile and compressive load.
5. Torque measurement Strain gauge transducer.
6. Speed measurement using magnetic proximity sensor.
7. Speed measurement using a Stroboscope.
8. Study of the characteristics of a LDR.

CONTROL ENGINEERING LAB
Code : EI 593 (EE)
Contacts : 3P
Credits : 2

1. Familiarization with MATLAB control system toolbox, MATLAB-SIMULINK toolbox and PSPICE.
2. Study of step response for first and second order system with unity feedback with display on CRT screen and calculation of parameters for different system designs.
3. Simulation of impulse response for types 0, 1 and 2 with unity feedback using MATLAB and PSPICE.
4. Determination of root-locus, Bode plot, Nyquist plot using MATLAB toolbox for a given second order transfer function and listing of the specifications.
5. Determine the effect of P, I, D actions on first order simulated process and obtaining the system transfer functions from Bode plot.

Data Structures & Algorithms
Code :
EI 594A(CSE)
Contacts : 3L
Credits : 3

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 Nonrecursive 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.

DBMS Lab
Code : EI 594B(CSE)
Contacts : 3L
Credits : 3

Structured Query Language

1. **Creating Database**
   - Creating a Database
   - Creating a Table

- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

2. **Table and Record Handling**
   - INSERT statement
   - Using SELECT and INSERT together
   - DELETE, UPDATE, TRUNCATE statements
   - DROP, ALTER statements
3. **Retrieving Data from a Database**
   - The SELECT statement
   - Using the WHERE clause
   - Using Logical Operators in the WHERE clause
   - Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING

Clause

   - Using Aggregate Functions
   - Combining Tables Using JOINS
   - Subqueries

4. **Database Management**
   - Creating Views
   - Creating Column Aliases
   - Creating Database Users
   - Using GRANT and REVOKE

CURSORS IN ORACLE PL / SQL
WRITING ORACLE PL / SQL STORED PROCEDURES

Software Engineering LAB
Code : EI 594C(CSE)
Contacts : 3L
Credits : 3

SEMESTER – VI
Theory

Principles of Management
HU-601
Contracts: 2L
Credits- 2

1. Basic concepts of management: Definition – Essence, Functions, Roles, Level.
2. Functions of Management : Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.
3. Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
4. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management.
5. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship
6. Leadership: Concept, Nature, Styles.
7. Decision making: Concept, Nature, Process, Tools & techniques.
8. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.
9. Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
10. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Readings:

1. Management : Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz , Revised edition, Tata McGraw Hill(TMH)
3. Management – Stoner, James A. F. (Pearson)
4.Management - Ghuman, Tata McGraw Hill(TMH)

(All periods will be of at least 50 minutes duration)

PROCESS CONTROL - I
Code : EI 601
Contacts : 3L+1T
Credits : 4

Topics	No of periods
Module I	
General Review of Process, Process Control and Automation. Servo and Regulatory Control, Basic process control loop block diagram. Characteristic parameters of a process – Process Quantity, Process Potential, Process Resistance, Process Capacitance, Process Lag, Self Regulation	10
Process modelling, process equations – their limitations - general approach. Typical processes and derivation of their transfer functions	
Characteristics and functions of different modes of control actions : Schemes and analysis of On-Off, Multistep, Floating, Time Proportional, PID control Effect of disturbances and variation in set point in process control. Offset - why it appears and how it is eliminated – analysis and mathematical treatment	
Module II	
Process Reaction Curves, Controllability - using (i) deviation reduction factors (ii) gain bandwidth product, State Controllability	8
Tuning of Controllers : both Closed and Open loop methods (Ziegler – Nichols, Cohen – Coon, PRC method and 3-C method of parameter adjustment)	
Electronic PID controller design Pneumatic Controllers - brief analysis	
Module III	
Different control strategies - schemes, brief analysis and uses (i) Ratio control (ii) Cascade control (iii) Feedforward control (iv) Multivariable control	6
Module IV	
Final Control Element: Actuators (Pneumatic Actuators, Electrical Actuators) and Control Valves (Globe, Ball, Butterfly, Gate, Pinch), Different Parts, Fail Position, Valve characteristics, Cv, Single & Double Seated Valves, Valve sizing, Valve selection, Cavitation, Flashing, Noise Control Valve Accessories – Air Filter Regulator, I/P Converter, Pneumatic Positioner, Electro-Pneumatic Positioner, Limit Switches, Motion Transmitters Brief study of Safety Valves and Solenoid valves	8
Module V	
Introduction to Programmable Logic Controllers – Basic Architecture and Functions; Input-Output Modules and Interfacing; CPU and Memory; Relays, Timers, Counters and their uses; PLC Programming and Applications. Introduction to DCS(6+2)	8

Books:

1) D. Patranabis, Principles of Process Control, TMH, New Delhi, 2nd Ed.
2) D. P. Eckman, Automatic Process control, John Wiley, New York
3) P. Harriott, Process control, Mc Graw Hill, New York
4) B. W. Bequette, Process Control – Modeling, Design and Simulation, PHI
5) D. R. Coughanowr, Process Systems Analysis and Control, McGraw Hill
6) G. Stephanopoulos, Chemical process Control, PHI
7) C. D. Johnson, Process Control Instrumentation Technology, PHI
8) B. G. Liptak, Instrument Engineers Handbook, Chilton Book Co., Philadelphia
9) W. Bolton, Programmable Logic Controllers, Elsevier

10) Webb & Reis, Programmable Logic Controllers, PHI

(All periods will be of at least 50 minutes duration)

ELECTRONIC INSTRUMENTATION AND MEASUREMENT

Code : EI 602
Contacts : 3L+1T
Credits : 4

Topic	No. of periods
Module I	
Building blocks of Electronic Instruments: Voltage controlled oscillators, Phase Locked Loop, Charge Amplifier, Programmable Gain Amplifier, Current Mirror, Voltage to frequency and frequency to voltage converters	6
Analogue Electronic Instruments: Introduction, Basic Emitter Follower Voltmeter, Voltmeters with IC Operational Amplifiers, True R.M.S Voltmeter, Digital voltmeters, Q meter	5
MODULE II	
Current measurement with Analogue Electronic Instruments – Current-to-voltage converter type Electronic Ammeters, Chopper stabilized amplifiers for measurement of very low voltages and currents.	4
Cathode ray oscilloscopes and its applications: Cathode Ray Tube, Deflection Amplifiers, Oscilloscope Time Base, Dual-Trace Oscilloscopes, Oscilloscope Controls, Oscilloscope Probes, Delayed time base oscilloscope, Digital Storage Oscilloscope.	6
Module III	
Digital instruments: Introduction, Basic Digital Displays – LEDs and LCD panels. Display Drivers and Latches, Time Base generation with Crystal Oscillators and Dividers.	4
Design and Implementation of a simple Digital Frequency Meter, Errors in frequency measurement – possible remedies, Time and Ratio measurement.	4
Module IV	
Spectrum Analyzer	3
Interference and Noises	4
Introduction to Virtual Instrumentation	2
Total	38

Books:

1. Helfrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
2. Bell, David : Electronic Instrumentation & Measurement, Reston Publishers
3. D.C. Patranabis, Principles of Electronic Instrumentation, PHI
4. H.S. Kalsi, Electronic Instrumentation, Tata McGraw Hill
5. Wolf S., Student Reference Manual for Electronic Instrumentation Laboratories, Englewood Cliffs, Prentice Hall

(All periods will be of at least 50 minutes duration)

ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
Code: EI 603
Contacts: 3L+1T
Credits : 4

Topic	*No .of Periods*
Module I: Intel 8086/8088 Microprocessor: Architecture, Clock Generator, Resetting the microprocessor, Wait State Inserting, Bus Buffering, Interrupts, and Assembly Language Programming and Addressing Modes.	8
Module II: Interfacing Memory: Classification of Memory, Address decoding (using logic gates, decoders and PAL), Interfacing Static RAM (6116 – 2K, 6264 – 8K), Interfacing EPROM (2764 – 8K, 27256 – 32K), Designing Memory Modules (higher capacity say 512K) using memory chips (say 8K). Interfacing I/O Devices.	6

Module III: Interfacing and assembly language monitor program for Key Board (one dimensional, two dimensional) and 7-segment display, Stepper Motor through 8255A, Data transfer between two microprocessor based systems through 8255. 8237 DMA controller and interfacing with 8086 up Programmable communication interface- Intel 8251 USART. Programmable Interrupt Controller- 8259A.	8
Module IV: Introduction to single chip microcontrollers: Intel MCS-51 family features, 8051/8031 architecture, pin configuration, I/O ports and Memory organization. Instruction set and basic assembly language programming. Interrupts, Timer/Counter and Serial Communication. MCS-51 applications: Square wave and pulse wave generation, LED, A/D Converter and D/A Converter interfacing to 8051. Introduction to PIC micro-controller	14
	36

Books:

1. Douglas V. Hall – Microprocessors & Interfacing, Tata McGraw-Hill
2. Ray & Bhurchandi – Advanced Microprocessors & Peripherals, Tata McGraw-Hill
3. Walter A. Tribel – The 8088 and 8086 Microprocessors, Pearson Education
4. Barry B. Brey – The Intel Microprocessors, PHI/Pearson Ed. Asia
5. Muhammed Ali Mazidi and Janice Gillispie Mazidi – The 8051 Microcontroller and Embedded Systems, Pearson Education Inc.
6. Ajay V Deshmukh – Microcontrollers Theory and Applications, Tata McGraw-Hill

Kenneth J. Ayala – The 8086 Microprocessor, Cengage Learnin

(All periods will be of at least 50 minutes duration)

BIOMEDICAL INSTRUMENTATION
Code : EI 604A
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Introduction to the physiology of cardiac, nervous and muscular and respiratory systems.	2
Module II	
Transducers and Electrodes: Different types of transducers and their selection for biomedical applications.	3
Electrode theory, different types of electrodes Hydrogen Calomel, Ag-AgCI, pH, PO2 Pco2 electrodes, selection criteria of electrodes.	3
Module III	
Measurement of Blood Pressure & Blood flow	5
Cardiac output and Cardiac rate, Electrocardiography, Cardiac pace-maker	5
Measurement of Electrical Activities in Muscles and Brain: electromyography, Electroencephalograph and their interpretation.	3
Module IV	
Medical Imaging: Ultrasound imaging and IR Imaging.	6
Biotelemetry: Transmission and Reception aspects of Biological signals via long distances.	3
	30

Books:

1. Webster J S – Medical Instrumentation – Application and Design
2. Cromwell L – Biomedical Instrumentation and Measurement, Pearson
3. Khandpur R S – Handbook of Biomedical Instrumentation, TMH, N. Delhi 1991
4. Astor B R – Introduction to Biomedical Instrumentation and Measurement, McMillan.
5. Carr – Introduction to Biomedical Equipment Technology 4/e – Pearson
6. Chatterjee Miller – Biomedical Instrumentation, Cengage Learning

(All periods will be of at least 50 minutes duration)

NON CONVENTIONAL ENERGY SOURCES
Code : EI 605D
Contacts : 3L
Credits : 3

Topic	No. of periods

Module I

Classification of Energy Sources Advantages of Non Conventional Energy Sources over Conventional Sources Economics, Impact on Environment	2
Thermal Energy Generation from Solar Energy: Solar radiation and its Characteristics, Solar Collector: flat Plate, evacuated tube, focusing, Solar Energy use for water heating, Solar thermal power generation.	5
Principle of energy conversion in Solar Photovoltaic cells, Different types of PV Cells, Mono-poly crystalline and amorphous Silicon solar cells. Design of PV array. Efficiency and cost of PV systems.	4

Module II

Electricity Generation from Wind Energy: Wind as energy source, Design of Wind turbine, Selection of site of Wind farm, characteristics of different types of wind generators used with wind turbines.	5
Electricity Generation from Bio Energy: Resources and conversion process: bio gas conversion, bio gas plant, bio mass gasifier, cogeneration. Bio diesel: Sources, usability and advantages over mineral product	6

Module III

Electricity Generation from Tidal Energy: Principle, selection of site, Economics and future prospect.	2
Electricity Generation from Wave Energy: Principle , selection of site and future prospect	2
Electricity Generation from Geo thermal Energy: Principle , location , economics and prospect	2
Introduction to Energy Conservation & Audit	2
	30

Books:

1. Bansal, Kleeman & Melisa - "Renewable Energy Sources & Conversion Technology" - TMH New Delhi.
2. S P Sukhatme - "Solar Energy"
3. Twidell & Weir - "Renewable Energy Resources"; ELBS
4. Non Conventional Energy Sources – G. D. Rai

(All periods will be of at least 50 minutes duration)

NON DESTRUCTIVE TESTING AND ULTRASONIC INSTRUMENTATION
Code : EI 604C
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Introduction and importance of NDT. General Principles and Basic Elements of NDT.	2
Surface feature inspection and testing : General, Visual, Chemical, and Mechanical	4
Magnetic-magnetization, flux, and Electro potential, Electrical resistivity, Electromagnetic-eddy current techniques.	5
Module II	
Ultrasonic waves, principle of propagation	2
Ultrasonic Test methods: Echo, Transit time, Resonance, Direct contact and immersion types	5
Module III	
Ultrasonic methods of measuring thickness, depth, flow, level etc. Various parameters affecting ultrasonic testing and measurements, their remedy	8
Ultrasonic in medical diagnosis and therapy	4
TOTAL	30

Books:

1. Mclutive p (Ed) – NDT Handbook, American Society for NDT, 1989.
2. Hull B and John V – Non Destructive Testing, FI BS/McMillan.
3. Krantkramer - Ultrasonic Testing of materials, Springer 2005
4. Handbook of Nondestructive Testing, Mc Graw Hill, 1998
5. U. Schnars, W. Jeuptner - Digital Holograpy, Springer, 2005
6. W. J. Price – Nuclear radiation Detection, Mc Graw Hill, New York, 1958
7. Krauthsamer J and Krauthsamer H – Ultrasonic Testing of Materials, Springer Verlag, Berlin, New York.
8. Wells N T – Biomedical Ultrasonics, Academic Press, London 1977.

Digital Signal Processing
Code : EI 605A(ECE)
Contacts : 3L

Credits : 3

MODULE – I:

Discrete-time signals:

Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences. 3L

LTI Systems:

Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlap-add methods to compute convolution supported with examples and exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems. 6L

MODULE –II:

Z-Transform:

Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Z-transform, initial value theorem, Perseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises. 6L

Discrete Fourier Transform:

Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples and exercises. 5L

Fast Fourier Transform:

Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises. 4L

MODULE – III:

Filter Design:

Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows. 5L

MODULE – IV:

Digital Signal Processor:

Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language. 4L

FPGA:

Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA. 3L

TEXT BOOKS:

1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
2. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
4. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.
5. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

REFERENCE BOOKS:

1. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
2. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
3. Digital Signal Processing; A Hands on Approach, C. Schuler & M.Chugani, TMH Publishing Co.
4. Digital Signal Processing, A. Nagoor Kani, TMH Education
5. Digital Signal Processing S. Poornachandra & B. Sasikala, MH Education
6. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
7. Texas Instruments DSP Processor user manuals and application notes.
8. Xilinx FPGA user manuals and application notes.
9. Digital Signal Processing: A MATLAB-Based Approach, V.K.Ingle and J.G.Proakis, Cengage Learning
10. Modern Digital Signal Processing,V. Udayashankara, PHI Learning

Microwave Engineering
Code : EI 605B(ECE)
Contacts : 3L
Credits : 3

Total Lectures: 39 periods (minimum) :

Module	Topics	Hours
1	• **Introduction** RF & Microwave Spectrum, Typical applications of RF and Microwave, Safety considerations.	1
	• **Microwave Waveguide and Waveguide Resonator** Rectangular Waveguide- Design consideration, TE & TM modes, TE_{10} mode analysis, cut-off frequency, propagation	6

	constant, intrinsic wave impedance, phase and group velocity, power transmission, attenuation, waveguide excitation, wall current; Introduction of circular waveguide; Rectangular waveguide resonator- Design consideration, resonant frequency, Q-factor, excitation.	
	• **Planar Transmission line** Micro-strip lines, Coplanar waveguide, Slot line-design consideration, field patterns, propagation characteristics, Comparison for different characteristics of the above mentioned lines.	**3**
2	**4.High frequency Circuit Elements:** Difference in High frequency and relatively low frequency behavior of Lumped circuit components. Miniaturization and Design of Lumped components at High RF. Realization of reactive elements as Waveguide and Planar Circuit components.	**4**
	5.Waveguide Passive Components and their S-matrix Representation N-port networks-Properties of S matrix, Transmission matrix & their relationships; Microwave passive components and their S matrix representation: Attenuators, Phase shifter, Directional coupler, Bethe-hole coupler, Magic tee, hybrid ring, Circulators, Isolators; Design procedure of filter (maximally flat and equal ripple) using insertion loss method-specification, low-pass prototype design, scaling and conversion, implementation.	**8**
3	**6.Microwave Tubes** Electron beam & Field interaction for energy exchange in resonant (two cavity klystron, Reflex Klystron, Magnetron) and non-resonant (TWT &BWO) microwave active devices: Typical characteristics & applications (only physical explanation is required, no mathematical derivation required).	**4**
	7.Semiconductor Microwave devices TED (Gunn diode) & Avalanche Transit Time (IMPATT) device, Schottky diode, PIN diode- characteristics & applications; Microwave bipolar transistor, Microwave field effect transistor(MESFET).	**5**
	8.Microwave Amplifier Design Basic consideration in the design of RF amplifier- Transistor S-parameter, Stability, matching network, noise figure; Matching network design using lumped elements and L-Section. Brief introduction to NBA, LNA.	**4**
4	**9.Typical Microwave Test Bench & measurement** VSWR meter, Tunable detector, Slotted line and Probe detector, Frequency meter, Network analyzer, Measurement of VSWR – low, medium and high, Measurement of power: low, medium and high, Frequency measurement.	**4**

Text Books:

1. Microwave Engineering, 3Rd Ed David M. Pozar, Willey & Sons Inc.
2. Microwaves, K C Gupta, New Age Publishers.
3. Microwave Engineering, A Das & S Das, TMH.
4. Microwave Devices & Circuits, SY Liao , Pearson Education /PHI

References Books:

1. *Microwave Engineering-Passive Circuits, PA Rizzi , Pearson Education.*
2. *Foundation of Microwave Engineering, 2ed edition, Robert E Collin, McGraw Hill, Inc.*
3. *Microwave Devices & Circuit Design , GP Srivastava & VL Gupta, PHI*

Antenna Theory & Propagation
Code : EI 605C(ECE)
Contacts : 3L
Credits : 3

Module-I	A. Review of Maxwell's Equation; Radiation of e.m waves and introducing Antenna; Vector Potential and Retarded Vector Potential; Radiation fields of a Hertzian dipole(electric); Duality Principle, Radiation fields due to short magnetic dipole. B. Antenna Characteristics: Radiation Pattern, Beam Width; Radiation Resistance and efficiency; Directivity and Gain; Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna.	**7**
Module-II	A. Radiation fields and Characteristics of λ/2 dipole; discussion on λ/4 monopole antenna; Current distribution and Radiation patterns of center-fed dipoles of length λ, 3λ/2 and 2 λ. Horizontal and Vertical antennas over a plane ground. B. Antenna Arrays: electric Field due to 2 element arrays, 3 element Arrays; Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Phased array.	**9**
Module-III	A. Characteristics and properties of :Travelling Wave Antenna, Helical Antenna, Folded Dipole, Yagi-Uda Array, Loop Antenna, Electrically Short Antennas, Broad Band Antenna (Log periodic Antenna), Microstrip Patch Antenna. B. Radiation from an aperture: Sectoral and Pyramidal Horn Antennas, Design of Optimum Horn Antenna; Parabolic and Corner Reflectors and feed systems. [Major stress on Characteristics features, applications (including frequency at which used), advantages and disadvantages, major design principles and equations (without long and detailed derivations]	**10**

Module-IV	A. Methods of Propagation: Ground Wave Propagation, Components of ground wave, Field strength dependence on physical factors. Sky wave Propagation; Ionospheric Layers; Virtual Height, Critical Frequency, MUF, Skip distance, Sporadic Reflections. Space wave propagation: Tropospheric Scatter, Ducting Super refraction, Sub refraction. B. Friss Transmission Formula, SNR of a Radio Link. Physical (Medium) effects on Radio wave Propagation: Absorption, Refraction and Radio Horizon, Diffraction, Multipath Propagation and fading, Noise, Doppler effect.	**10**

Recommended (Text Books)

1. Antenna (for all application), John D. Kraus and Ronald J. Marhcfka; Tata- MacGraw Hill, 3rd Edition
2. Antenna & Wave Propagation, K.D Prasad; Satya Prakashan, New Delhi, 3rd Edition
3. Antenna Theory: Analysis & Design, Constantine A. Balanis; Willey, 3rd Edition

Reference Book

1. Elements of Electromagnetics; Mathew N.O. Sadiku, Oxford University Press, 5th Edition(2010)
2. Electromagnetic Waves & Radiating Systems, EC Jordan & K.G. Balmain; Pearson Education, 2nd Edition (2009)
3. Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)

Practical

PROCESS CONTROL LAB
Code : EI 691
Contacts : 3P
Credits : 2

1. Study of Flow, Level, Pressure, Temperature processes and construction of the P&I diagrams in accordance with ISA guidelines / standards
2. Study of a typical Temperature Control Loop having Furnace, suitable final control element, Temperature transmitter, conventional PID controller/Control System, and data logger/recorder
3. Study of a typical Pressure Control Loop having Pressure source, Pressure Transmitter, Motorized/Pneumatic control valve, and conventional PID controller/Control System
4. Study of a typical Flow Control Loop having suitable Flow meter, Motorized/ Pneumatic control valve, and conventional PID controller/Control System
5. Study of a typical Level Control Loop having Level Transmitter, Motorized/ Pneumatic control valve, and conventional PID controller/Control System
6. Study of a typical Air Duct Flow Monitoring and Control
7. PLC Programming through PC
8. Study of a PC based Automation Software / Simulation Software
9. PLC and DCS based instrumentation experiments.

ELECTRONIC INSTRUMENTATION AND MEASUREMENT LAB
Code : EI 692
Contacts : 3P
Credits : 2

1. Study of Static Characteristics of a Measuring Instrument
2. Study of Dynamic Characteristics of a Measuring Instrument
3. Acquaintance with basic structure of DMM and measurement of different electrical parameters
4. Realization of Data Acquisition system
5. Wave and spectrum analysis
6. Realization of a V-to-I & I-to-V converter.
7. Statistical analysis of errors in measurement .
8. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).

ADVANCED MICROPROCESSORS AND MICROCONTROLLERS LAB

Code : EI 693

Contacts : 3P

Credits : 2

1. Familiarization with 8086/88 trainer kit components.
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. a) Familiarization with 8086/88 simulator on PC.
   b) Study of prewritten programs using basic instruction set (data transfer, Load/ Store, Arithmetic, Logical) on the simulator.
   c) Assignments based on above
4. PROGRAMMING USING KIT/SIMULATOR FOR

   Table look up
   i) Copying a block of memory
   ii) Shifting a block of memory
   iii) Packing and unpacking of BCD numbers
   iv) Addition of BCD numbers
   v) Binary to ASCII conversion
   vi) String Matching
   vii) Sorting etc.
5. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g., subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc
6. INTERFACING WITH I/O MODULES:
   i) ADC
   ii) Speed control of mini DC motor using DAC
   iii) Temperature sensor and display temperature
   iv) Relay
   v) Keyboard through 8279 and 8255A
   vi) Multi-digit Display with multiplexing through 8255A & 8279
   vii) Stepper motor
7. 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

SEMINAR

Code : EI 681
Contacts : 3P
Credits : 2

VII SEMESTER

Telemetry and Remote Control
Code : EI701
Contacts : 3L+1T
Credits : 4

Topic	No. of periods
Module I	
Purpose of telemetry, basic scheme, voltage, current and frequency telemetry	2
Concepts of Information transfer, bits, symbols, codes -source, line, channel, BCD, ASCII, BAUDOT, AMI, CMI, Manchester, HDBM, Block, Differential, Hamming, and Convolution.	6
Modulation codes: PAM, PFM, PTM, PCM	2
Module II	
Review of modulation and multiplexing: FM-AM, FM-FM, PAM-AM, PAM-FM, PCM-AM, etc. Quantization and conversion methods, error in quantization.	2
Inter symbol interference, Bit error rate, noise	2

FDM systems, IRIG standards in FDM systems. SCO's, Mux and Demux circuits, Detectors and Demodulators, Pulse averaging, Quadrature FM and PLL, Mixers	6

Module III

TDM systems (architecture)- TDM- PAM, PAM- PM, TDM- PCM systems, synchronization.	4
Modems, Digital modulation and Shift-keying, FSK, PSK, DPSK, QPSK, QAM, Modem Protocols	4

Module IV

Fiber optic Communication- The Fibre as transmission medium, Interconnections, Repeaters, Sources, Detectors	4
Satellite Communication: TT and C services, subsystems, The earth station, Multiple access schemes: FDMA, TDMA, and CDMA.	4
Remote control: concept and example from a typical industrial application	2
	38

Books:

1. D. Patranabis, Telemetry principles, TMH, New Delhi
2. E. L. Gruenberg, Handbook of Telemetry and Remote control, Mc Graw Hill
3. Modern Digital and Analog Communication Systems - B. P. Lathi, Oxford University Press
4. Swobada G – Telecontrol Method and Application of Telemetering and Remote Control, Von Nostrand, 1971

ANALYTICAL INSTRUMENTATION
Code : EI 702
Contacts : 3L+1T
Credits : 4

TOPICS	No. of Periods
Module I:	
Introduction to Analytical Instrumentation : Classification, types of Instrumental methods Measurement of Humidity : dry & wet psychrometer, hair hygrometer, electrical type, Electrolysis type hygrometer, dew point meter. Moisture : electrical conductivity type, capacitive method type, IR method, microwave method, crystal oscillator method. Viscosity : Poiseuilles formula, Saybolt's viscometer, rotameter type viscometer, friction tube viscometer, Searle's rotating cylinder type. Density: pressure head type, buoyancy effect type, Gow-Mac densitometer, radioactive type, photoelectric type, displacer type. Gas Analysis: a) Thermal conductivity method. b) Heat of Reaction method. Oxygen Analysis: a) Magneto Dynamic instrument(Pauling cell) b) Thermomagnetic type or Hot wire type instrument. c) Zirconia oxygen analyzer. d) Mackerth type galvanic analyzer for dissolved oxygen analysis.	10
Module II:	
Liquid analysis: a) Electrodes-Ion selective, Molecular selective types- their variations. b) pH analysis: pH electrodes, circuit for pH measurement and applications. c) Conductivity cells – standards, circuits. d) Polarography- apparatus, circuits and techniques-pulse polarography, applications e) Colorimetry	10
Module III:	
Spectroscopic Methods : Introduction, Laws relating to absorption of radiation, Molecular Absorption Spectroscopy in UV & VIS ranges: sources, wavelength selectors, sample container, detectors, Spectrophotometers (Single beam & Dual beam arrangement). Atomic Absorption & Emission spectroscopy : Atomizers, sources, single & dual beam arrangement.	12

Plasma Spectroscopy : Sequential & Simultaneous multichannel Instruments. Atomic X Ray spectrometry : Absorption & diffraction phenomena, sources, detectors, techniques. IR Spectroscopy : sources, monochromators, detectors. IR Spectrometer, FT-IR spectrometers.	
Module IV:	
Chromatography :Introduction, basic definitions, some relationships. Gas chromatography : basic parts, columns ,detectors, techniques. LC : types, HPLC : basic parts, sample injection system, column, detectors, Applications.	8
Total	**40**

Books: Principles of Industrial Instrumentation- D.C. Patranabis, Publisher: Tata McGraw Hill
Principles of Instrumental Analysis- Skoog, Holler, Nieman, Publisher: Thomson Brooks/Cole
Introduction to Instrumental Analysis- Robert D. Braun, Publisher: Pharma Book Syndicate
Handbook of Analytical Instruments- R.S. Khandpur, Publisher: Tata McGraw Hill

PROCESS CONTROL II
Code : EI 703
Contacts : 3L + 1T
Credits : 4

Module I

Digital Control Loop with continuous process and digital controller, advantages & limitations of Digital Control	1
Signal discretization - Sampling of continuous signal, sampling period considerations, sampling as impulse modulation, sampled spectra & aliasing. Signal reconstruction – Zero and First Order Hold Principles of discretization – finite difference approximation of derivatives, rectangular rules for integration, trapezoidal techniques / bilinear transformation, pole - zero matching, Impulse invariance method, Step invariance method, Mapping between s-plane and z-plane. Representation of digital control system – Linear Difference Equations, Pulse Transfer Function. Stability Studies - W - plane transforms, Jury Stability Criterion, Effect of sampling period Analysis of a single input-single output system by Z-transform techniques	12

Module II

Digital Modelling using discrete approximation, ARMA, ARX Loop Design using Digital Modelling	4
Digital Control Algorithms :- (a) Dead beat control (b) Dahlin's algorithm	3

Module III

DCS – Basic Components and their Functions. **HMI** – Operator & Engineering Interface – Functions and Requirements. **Communication** – ISO/OSI Reference Model ; Data Highway and Fieldbus ; Network Access protocols – TDMA, CSMA/CD, Token passing, Master – Slave; Network Transmission Media – Twisted Pair, Co-axial, FO ; Network Topology – Mesh, Ring, Star, Bus ; Management Information System (MIS) and Computer Integrated Processing (CIP). **Redundancy** – Processor, Bus and Input-Output level	10
Fuzzy logic control – Crisp Set, Fuzzy Set, Fuzzy Operators, Overview of FLC	2

Module IV

Control of specific process (a) Boiler Drum Level Control (b) Combustion Control of a Boiler Furnace (c) Control of heat exchangers (d) Control of pH of a solution	8
Total	**40**

Books:

1. J. R. Leigh, Applied Digital Control, Prentice Hall International, London
2. C. L. Smith, Digital Computer Process Control, Intex Publishers, Scranton
3. B. G. Liptak, Instrument Engineers Handbook, Chilton Book Co., Philadelphia
4. D. Patranabis, Principles of Process Control, TMH, New Delhi, 2nd Ed.
5. P.B. Deshpande and R. H. Ash, Elements of Computer Process Control, ISA,

Prentice Hall, Englewood
6. George Stephanopoulos, Chemical Process Control, PHI
7. M. Gopal, Digital Control and State Variable Methods
8. Nise, Control Systems Engineering, Wiley India
9. K. Ogata, "Discrete Time Control Systems", Pearson Education Inc
10. Driankov, Hellendoorn, Reinfrank, Introduction. to Fuzzy Control, Narosa

COMMUNICATION THEORY
Code : EI 704A
Contacts : 3L
Credits : 3

Credit: 3 **Contact: 3L**

Module	Content	Hour
1	**Elements of communication system:** The elements of a communication system, origin of noise and its effect, importance of SNR in system design. Basic principle of linear (AM) modulation, Generation of AM waves, Demodulation of AM wave. Basic principle of nonlinear (FM, PM) modulation. Generation of FM waves. Demodulation of FM waves. Sampling theorem, sampling rate, impulse sampling, reconstruction from samples, Aliasing. Analog pulse modulation-PAM (natural & flat topped sampling), PWM, PPM. Basic concept of Pulse code modulation, Block diagram of PCM, Multiplexing-TDM, FDM.	12
2	**Digital transmission:** Concept of Quantization & Quantization error, Uniform quantizer, Non-uniform quantizer, A-law and μ -law. Encoding, coding efficiency. Line coding & properties, NRZ & RZ, AMI, Manchester coding, PCM, DPCM. Base band pulse transmission, Matched filter, error rate due to noise, ISI, Raised cosine function, Nyquist criterion for distortion-less base band binary transmission, Eye pattern, Signal power in binary digital signal.	08
3	**Digital carrier modulation & demodulation technique:** Bit rate, Baud rate, Information capacity, Shanon's limit, M-ary encoding, Introduction to the different digital modulation techniques-ASK.FSK, PSK, BPSK, QPSK, mention of 8 BPSK, 16 BPSK. Introduction to QAM, basic of 8 QAM, 16 QAM. Basic concept of Delta modulating, Adaptive delta modulation. Introduction to the concept DPCM. Basic concept of spread spectrum modulation.	12
4	**Introduction to coding theory:** Introduction, News value & Information content, Entropy, Mutual information, Information rate, Shanon-Fano algorithm for encoding, Shanon's theorem- source coding theorem, Channel coding theorem, Information capacity theorem. Basic principle of Error control & coding.	8

Numerical problems to be solved in the class.
Text Books:

1. An Introduction to Analog and Digital communication, Simon Haykin, Wiely India.
2. Analog communication system, P. Chakrabarti, Dhanpat Rai & Co.
3. Principle of digital communication, P. Chakrabarti, Dhanpat Rai & Co.
4. Modern Digital and Analog Communication systems, B.P. Lathi, Oxford university press

Reference Books:

1. Digital and Analog communication Systems, Leon W Couch II, Pearson Education Asia.

2. Communication Systems, A.B. Calson, Mc Graw Hill.

MICROELECTRONICS & VLSI TECHNOLOGY
Code : EI 704B
Contacts : 3L
Credits : 3

Credit: 3 **Contact: 3L**

Module	Content	Hour
1	**Introduction to VLSI Design**: VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), Y-Chart, Digital VLSI Design Steps.	8
2	**MOS structure**: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat-band voltage, Potential balance & Charge balance, Inversion, MOS capacitances. **Three Terminal MOS Structure:** Body effect. **Four Terminal MOS Transistor**: Drain current, I-V characteristics. Current-voltage equations (simple derivation). **Scaling in MOSFET**: Short Channel Effects, General scaling, Constant Voltage & Field scaling.] **CMOS**: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.	12
3	**Micro-electronic Processes for VLSI Fabrication**: Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist **Basic CMOS Technology** – (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator **Layout Design Rule**: Stick diagram with examples, Layout rules.	10
4	**Hardware Description Language** – VHDL or Verilog Combinational & Sequential Logic circuit Design.	10

Text Books:
1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
3. Modern VLSI Design, Wayne Wolf, Pearson Education.
4. VHDL, Bhaskar, PHI.
5. Advance Digital Design Using Verilog , Michel D. Celliti, PHI
References:
1. Digital Integrated Circuits, Demassa & Ciccone, John Willey & Sons .
2. Modern VLSI Design: system on silicon, Wayne Wolf; Addison Wesley Longman Publisher
3. Basic VLSI Design, Douglas A. Pucknell & Kamran Eshranghian, PHI
4. CMOS Circuit Design, Layout & Simulation, R.J.Baker, H.W.Lee, D.E. Boyee, PHI

FPGA & RECONFIGURABLE COMPUTING
Code : EI 704C
Contacts : 3L
Credits : 3

Module –I: Introduction to Reconfigurable Computing (RC)
History, State-of-the-Art and Future Trends, Computing requirements as Power, Area and VLSI scaling, Mapping of Algorithm-analysis and speed-up, RC architectures- Fine Grain and Coarse Grain, Hybrid and Embedded Architectures, Supercomputers. 5L
Module-II: Reconfigurable Logic Devices:

FPGA and its internal architecture, computing elements, LUT, BRAM, interconnects, I/O Blocks, programming of FPGA and interfacing case study, ALU design, designing with embedded processors, introduction to Power PC and ARM processors. 6L

Module III: Hardware Description Language for RC:

Design cycle, algorithms, Hardware Description Language, VHDL, different design styles: data flow, structural and behavioral and practical logic circuit implementation example on FPGA, debugging, writing test bench, High level synthesis and Low level synthesis.

6L

Module IV: RC Configuration:

Application segmentation and Resource partitioning, spatial and temporal configuration, systolic architectures and algorithms, Bit serial, on the fly, multiplexing vs. run-time reconfiguration 4L

Module V: RC Implementation:

Virtual Hardware Components (VHC) design process, high level synthesis of VHC and optimization, VHC data-path and control unit design, simulation and verification of VHC, determination of reconfigurable scheme and associated loading mechanisms (temporal and spatial partitioning) for RC. 6L

Module VI: RC applications:

RC for DSP, DSP application building blocks, RC for Image processing, Bioinformatics and Network Security

5L

Text Books:

1. M. Gokhale and P. Graham; Reconfigurable Computing: Accelerating Computation with FPGAs, Springer, 2005
2. C. Maxfield ; The design Warrior's Guide to FPGAs: Devices, Tools and Flows, Newnes, 2004
3. C. Bobda, Introduction to Reconfigurable Computing : Architectures, Algorithm and Applications, Springer, 2005

Reference Books:

1. W. Wolf , FPGA Based Systems Design, PHI, 2004
2. P. Lysagt and W. Rosenstiel, New Algorithms, Architectures and Applications for Reconfigurable Computing, Springer, 2005

COMPUTER NETWORKING
Code : EI 705A
Contacts : 3L
Credits : 3

Module	Content	Hour
1	**Overview of Data Communication and Networking:** Introduction, Data communications: components, data representation (ASCII, ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study. **Physical Level:** Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit Switching: time division & space division switch, TDM bus; Telephone Network.	10
2	**Data link Layer:** Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC;] **Medium Access sub layer:** Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet (in brief).	10
3	**Network layer:** Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, sub netting; Routing : techniques, static vs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Procols: ARP, IP, ICMP, IPV6. **Transport layer:**	12

	Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm,	
4	**Application Layer:** Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls. **Modern topics:** ISDN services & ATM, DSL technology, Cable Modem: Architecture and operation in brief. Wireless LAN: IEEE 802.11, Introduction to blue-tooth.	08

Numerical problems to be solved in the class.

Text Books:

1. Data Communications and Networking (3rd Ed.), A. Forouzan , TMH
2. Computer Networks (4th Ed.), A. S. Tanenbaum, Pearson Education/PHI
3. Data and Computer Communications (5th Ed.), W. Stallings, PHI/ Pearson Education

Reference Books:

1. Computer Networking -A top down approach featuring the internet, Kurose and Rose Pearson Education
2. Communication Networks, Leon, Garica, Widjaja, TMH
3. Communication Networks, Walrand, TMH.
4. Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.), Comer, Pearson Education/PHI

MULTIMEDIA
Code : EI 705B
Contacts : 3L
Credits : 3

Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications

Text and Audio [6L]
Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI

Image and Video (8L)
Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.

Synchronization [4L]
Temporal relationships, synchronization accuracy specification factors, quality of service

Storage models and Access Techniques [(4L]
Magnetic media, optical media, file systems (traditional, multimedia)
Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD

Image and Video Database [8L]
Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing
Document Architecture and Content Management [9L]
Content Design and Development, General Design Principles
Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications

Multimedia Applications [4L]

Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.

Books:

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
2. Nalin K. Sharda , Multimedia Information System , PHI.
3. Fred Halsall , Multimedia Communications , Pearson Ed.
4. Koegel Buford , Multimedia Systems , Pearson Ed.
5. Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
6. Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.
7. J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.
8. Prabhat K. Andleigh & Kiran Thakrar , Multimedia Systems Design , PHI.

INTERNET TECHNOLOGY
Code : EI 705C
Contacts : 3L
Credits : 3

34L
Module I-6L
Introduction (1L):
Overview, Network of Networks, Intranet, Extranet and Internet.

World Wide Web (1L):
Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP.

Review of TCP/IP (1L):
Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6.

IP Subnetting and addressing (1L):
Classful and Classless Addressing, Subnetting. NAT, IP masquerading, IP tables.

Internet Routing Protocol (1L):
Routing -Intra and Inter Domain Routing, Unicast and Multicast Routing, Broadcast.

Electronic Mail (1L):
POP3, SMTP.

Module II-9L
HTML (3L):
Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Colorname, Colorvalue.

Image Maps (1L):
map, area, attributes of image area.

Extensible Markup Language (XML) (4L):
Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief.

CGI Scripts (1L):
Introduction, Environment Variable, GET and POST Methods.

Module III-10L
PERL (3L):
Introduction, Variable, Condition, Loop, Array, Implementing data structure, Hash, String, Regular Expression, File handling, I/O handling.

JavaScript (4L):
Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation.

Cookies (1L):
Definition of cookies, Create and Store a cookie with example.

Java Applets (2L):

Container Class, Components, Applet Life Cycle, Update method; Parameter passing applet, Applications.

Module IV-4L

Client-Server programming In Java (2L):

Java Socket, Java RMI.

Threats (1L):

Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks.

Network security techniques (2L):

Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH).

Firewall (1L):

Introduction, Packet filtering, Stateful, Application layer, Proxy.

Module v-5L

Internet Telephony (1L):

Introduction, VoIP.

Multimedia Applications (2L):

Multimedia over IP: RSVP, RTP, RTCP and RTSP. Streaming media, Codec and Plugins, IPTV.

Search Engine and Web Crawler (2L):

Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

Reference:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011. (Chapters 5,6,12)

Practical

TELEMETRY AND REMOTE CONTROL LAB
Code : EI 791
Contacts : 3P
Credits : 2

1. Study of voltage telemetry system using a process variable transducer.
2. Study of 4-20 mA current telemetry system: 2 wire and 3 wire systems.
3. Study of a frequency telemetry system using a VCO and a PSD.
4. Study of a FDM and Demultiplexing system using wire transmission for 2 to 4 channels.
5. Study of a PCM system.
6. Study of a Bio – Telemetry System.
7. Study of a (wireless) remote control system.
8. Study of Computerized control wireless telemetry system.

COMMUNICATION LAB
Code : EI 794A
Contacts : 3P
Credits : 2

Experiments on: -

1. Study of Amplitude modulation & Demodulation technique.
2. Study of Double Side Band Suppressed Carrier (DSB-SC) & Demodulation technique.
3. Study of Single Side Band Suppressed Carrier (SSB-SC) & Demodulation technique.
4. Study of Frequency Modulation & Demodulation.
5. Study of Time Division Multiplexing (TDM) & Demultiplexing.
6. Study of Frequency Shift Keying (FSK).
7. Study of Pulse Amplitude Modulation (PAM).
8. Study of Pulse Width Modulation (PWM).

9. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).

MICROELECTRONICS & VLSI LAB
Code : EI 794B
Contacts : 3P
Credits : 2

Laboratory 10. Design of 8 bit synchronous Counter (3 Hrs.)

Laboratory 11. Design of 8 bit bi-directional register with tri-stated input/output bus (3 Hrs.)

Laboratory 12 Design of a 12 bit CPU with few instructions and implementation and validation on FPGA (15 Hrs.)

1. M.J.S Smith , Application Specific Integrated circuits ,Pearson.
2. P.J Anderson ,The designer's guide to VHDL, Morgan Kaufman , 2nd edition ,2002.
3. W.Wolf , Modern VLSI Design: Systems on silicon , Pearson
4. G.Hatchel and F.Somenzi , logic Synthesis and verification Algorithms,Kluwer,1998

References:

1. http://www-ee.eng.hawaii.edu/~msmith/ASIC/HTML/ASIC.htm#anchor935203
2. J.Bhasker ,A VHDL Primer , BS Publications/Pearson Education.

FPGA & Reconfigurable computing lab
Code : EI 794C
Contacts : 3P
Credits : 2

1. Implementation of basic logic gates with VHDL on FPGA using different design styles.
2. Implementation of Multiplexers, Priority Encoder, decoder, counters etc. with VHDL on FPGA using different design styles.
3. Design and implementation of 16-bit ALU with VHDL on FPGA and verification by writing a test bench.
4. a) Generation of Filter co-efficient of a LPF using Simulink FDA tool.
   b) Generation of VHDL codes for the LPF by coupling the co-efficient in "a" with Xilinx.
   c) Implementation of the LPF in FPGA using the code in "b".
   d) Testing of the LPF by using the hardware-in-the loop configuration.
5. Design and implementation of a real time user defined Traffic Light Controller using FSM method on an FPGA.
6. Interfacing of LCD display with FPGA and configuration for the scrolling display.

Computer Networking lab
Code : EI 795A
Contacts : 3P
Credits : 2

- IPC (Message queue)
- NIC Installation & Configuration (Windows/Linux)
- Familiarization with
  - Networking cables (CAT5, UTP)
  - Connectors (RJ45, T-connector)
  - Hubs, Switches
- TCP/UDP Socket Programming

- Multicast & Broadcast Sockets
- Implementation of a Prototype Multithreaded Server
- Implementation of
    - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
    - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
    - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

Multimedia lab
Code : EI 795B
Contacts : 3P
Credits : 2

1. Sound capturing & editing using tools like SOUNDFORGE
2. Image editing using tools like Adobe Photoshop
3. Creating/editing motion video/animation clips (using tools like Flash / Adobe Premier)
4. Creation of Content using HTML (basic tags, table form, frame, link to other Image)
5. Creating stylesheet using DHTML
6. Home Page creation using HTML, DHTML.

Books

1. Adobe , Adobe Photoshop 6.0: Classroom in a book Pearson Ed.
2. Anushka Wirasinha , Flash in a Flash- Web Development , PHI
3. Macromedia Flash5 fast and easy Web Development, Design, PHI
4. Castro, HTML4 for the World Wide Web, Pearson Ed.
5. Schurman & Purdi , Dynamic HTML in Action, Second Edition , PHI
6. Lozano, Multimedia- Sound & Video , PHI

Internet technology lab
Code : EI 795C
Contacts : 3P
Credits : 2

Applet

1. Create a banner using Applet
2. Display clock using Applet
3. Create different shapes using Applet
4. Fill colors in shapes using Applet
5. Goto a link using Applet
6. Create an event listener in Applet
7. Display image using Applet
8. Open a link in a new window using Applet
9. Play sound using Applet
10. Read a file using Applet
11. Write to a file using Applet

JavaScript

12. Validate the fields of a form using JavaScript.
13. Guess a number based on user input.
14. Program on image rollover using JavaScript.
15. Display clock using JavaScript.
16. Prompt, alert, array, looping in JavaScript.
17. Calculator using JavaScript.
18. Validate e-mail, phone no. using reg-ex in JavaScript.

Perl

19. Write a perl script to implement associative array.
20. Write a perl script to implement the regular expression as follows:

a). If a string contains any vowel, count the total number of vowels.
b). If a string starts with MCA and end with bw, print 1 else 0.
c). If string starts with 0 or any no. a's, then print 1 else 0.

21. Write an html code to call a perl script from cgi-bin.

22. Implement the following with regular expression in Perl:
a). a*bc
b). a* at least 2 b's
c). a*exactly 3 b's
23. A simple File operation using Perl.

Client Server Programming

24. Write a socket program to get the current date and time from the server.
25. Write a socket program where the client will send lowercase letters and the server will return uppercase letter.
26. Write a server and a client program to implement TCP chat server-client.
27. Create a simple calculator application using Java RMI.

HTML

1. Start your web page with an <html> tag
i) Add a heading.
ii) Add a title.
iii) Start the <body> section.
iv) Add the following text using <H1> and </H1> tags:
This Web page was designed by (your name)
v) Add the following text using <H2> and </H2> tags: My HTML assignment
vi) Add a horizontal line
vii) Insert an image to your web page.
Note: You should then refer to your image with just the filename, and NOT the entire pathname to the file.
viii) Add another horizontal line.
ix) Enter a paragraph of text.
Write about things you have learned in html.
Make sure the text in this paragraph is a color other than black, but something one can see.
Add a link that takes you to your favorite webpage.
x) Start a new paragraph. Add a three item ordered list. Make it creative (don't just say item 1, item 2, etc… and keep it clean)!
xi) Close out your body and html tags.

2. Start your web page with an <html> tag
i) Add a heading.
ii) Add a title.
iii) Start the <body> section.
iv) Start a new paragraph.
Use alignment attribute,
Use bold, italic, underline tags,
Use font tag and associated attributes,
Use heading tags,
Use preserve tag,
Use non breaking spaces (escape character).

3. Start your web page with an <html> tag
i) Add a heading.
ii) Add a title.
iii) Start the <body> section.
iv) Start a new paragraph.
Create Hyperlinks:
(a) Within the HTML document.
(b) To another URL.
(c) To a file that can be rendered in the browser.

4. Start your web page with an <html> tag
i) Add a heading.

ii) Add a title.
iii) Start the <body> section.
Create an unordered list,
Create an ordered list,
Use various bullet styles,
Created nested lists,
Use the font tag in conjunction with lists,
Create definition lists,
Use graphics as bullets.

5. Start your web page with an <html> tag
i) Add a heading.
ii) Add a title.
iii) Start the <body> section.
a) Create a simple table
Create borders and adjust border size.
Adjust table cell spacing.
Change border color.
Change table background color.
b) Align a new table on HTML page.
Perform cell text alignment,
Create multi-column tables,
Display information about your academic qualification into this table.

6. Start your web page with an <html> tag
i) Add a heading.
ii) Add a title.
iii) Start the <body> section.
Create a frameset:
Use frame tags,
Create vertical (column) frames,
Create horizontal (row) frames,
Create complex framesets,
Use the hyperlink tag to target displaying an HTML page to another frame.

7. Start your web page with an <html> tag
i) Add a heading.
ii) Add a title.
iii) Start the <body> section.
Create a simple HTML form.
Use the input tag to create a: text box; text area box; check box; list box; radio button; password field; popup menu; hidden field. Use submit and reset buttons. Create an admission form using the above information.
8. Create a web page that will include an image. Then create image map to watch different parts of that image closely.

9. Using frames as an interface, create a series of web pages where the theme is to provide resources (internet, intranet, static HTML pages) pertaining to the subject of HTML. Ideally, your goal is to create a resource that you can use long after this module when needing information on HTML. As a minimum requirement to this assignment your webpage should:
• Consist of at least 3 frames.
• Contain at least 5 URLs to internet and/or intranet sites that you can reference as part of your job.
• Contain at least 5 references to documents that you have created that you use on a regular basis.
• Contain at least 5 references to documents others have created that you use on a regular basis.
• Be organized in a fashion that is logical and intuitive to you.
• Is done with enough quality that you would not be opposed to it being a link at another site.

10. Create a web page as you wish and the html elements of the page will be styled by CSS.

XML

1. Write a XML program that will create an XML document which contains your mailing address.

2. Write a XML program that will create an XML document which contains description of three book category.

3. Create an XML document that contains the name and price per pound of coffee beans.
   i) In your XML document mention all properties of XML declaration.
   ii) The root element has name <coffee_bean>
   iii) Create nested elements for different types of coffee.
   iv) Validate the document and if any parsing error is present, fix them.

4. Create an XML document that contains airline flight information.
   i) In your XML document mention all properties of XML declaration.
   ii) The root element has name <airlines>
iii) Create three nested <carrier> elements for three separate airlines. Each element should include a name attribute.
iv) Within each <carrier> nest at least two <flight> ,each of which contains departure_city, destination_ city, fl_no, dept_time.
   v) Validate the document and if any parsing error is present fix them.

5. Create an XML version of your resume. Include elements such as your name and position desired. Nest each of your former employers within an <employer> element. Also, nest your educational experience within an <education> element. Create any other nested elements that you deem appropriate, such as <references> or <spcl_skills> elements.

6. Create a DTD on product catalog.

VIII Semester

Organisational Behaviour
HU801A
Contracts: 2L
Credits- 2

1. Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. **[2]**
2. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction. **[2]**
3. Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. **[2]**
4. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory. **[4]**
5. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. **[2]**
6. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication. **[2]**
7. Leadership: Definition, Importance, Theories of Leadership Styles. **[2]**
8. Organizational Politics: Definition, Factors contributing to Political Behaviour. **[2]**
9. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. **[2]**
10. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture. **[4]**

References:

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.

2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.

3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI

4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

POWER ELECTRONICS

Code : EI801A
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Power Semiconductor Devices: Rectifier diodes, fast recovery diode and Schottky barrier diode. Power BJT, Power MOSFET. SCR : types, characteristics, turn-on and turn-off methods, Triac. Gate turn-off thyristor (GTO), Insulated gate bipolar transistor (IGBT).	1 2 3 2
Common triggering devices and their applications: UJT and DIAC.	2
Module II	
Converters : (a) Rectifiers: Single phase and three phase controlled bridge rectifiers with inductive load / RL load, free wheeling diodes, Overlapping & Inversion (b) DC to DC converters (Choppers) : principle of step up and step down converters with R / RL load (c) DC to AC converters (inverters) : Single phase and three phase inverters (d) Cycloconverters : Single phase to single phase and three phase to single phase circuits, blocked group operation, circulating current mode	 4 2 3 2
Module III	
DC line commutation: resonant commutation, self commutation, auxiliary commutation, complementary commutation.	4
Applications: DC and AC drives, Switched Mode Power Supplies, Uninterrupted Power Supplies.	5
	30

Books:

1. P.C. Sen, Power Electronics, TMH, New Delhi
2. M. H. Rashid, Power Electronics, PHI/Pearson Education
3. C. W. Lander, Power Electronics, Mc Graw Hill
4. B. K. Bose, Modern Power Electronics, Jaico
5. Mohan N, Underland T M & Robbins W P – Power Electronics, John Wiley & Sons
6. P. S. Bimbhra – Power Electronics, Khanna Publishers

INDUSTRIAL DRIVES

Code : EI 801B
Contacts : 3L
Credits : 3

Topic	No of Periods
Module I : AC Drives • Basic Elements of a Variable Frequency Drive (VFD) • External Components in a typical Power and Control Circuit of a drive for a simple pump application • Drive Control modes : Variable Frequency Control, Sensorless Vector Control, Vector Control with sensor, Flux Vector Control, Direct Torque Control • Basic Specifications and Selection Procedure for AC Drives – with specific reference to Variable Torque and Constant Torque applications • Use of AC Drives for energy efficient production as applied to - Pumps, Fans, Compressors - Hoisting, Breaking, Lowering - Conveyor Technology	**12**

Module II : DC Drives • Modern Programmable DC Drives and its applications in - Winders & Un-winders - Wire Drawing Machine - Bar Rolling Mill - Rotary Kiln • Basic Specifications and Selection Procedure for DC Drives	**10**
Module III : Servo Motor and Servo Drives • Block Diagram of a typical Servo Controlled System with - velocity and torque feedback - velocity and position feedback • DC and AC Servomotors • Selection of Servomotor for an application • Fundamentals of Axis Control and its implementation	**8**
	30

Books :

Fundamentals of Industrial Drives, B.N. Sarkar, PHI
Fundamentals of Electric Drives, Gopal K Dubey, Narosa
Electrical Drives And Control, U.A. Bakshi, M.V.Bakshi, Technical Publications
Industrial Drives, Mukhtar Ahmad, MacMillan
Electric Drives, V Subramanyam, McGraw-Hill
Electric Drives, Boldea & Nasar, CRC
Vector Control of AC Drives, Boldea & Nasar, CRC

POWER PLANT INSTRUMENTATION
Code : EI 801C
Contacts : 3L
Credits : 3

Topic	No of Periods
Module I : General Concepts Power Plants of different types : Setups, energy conversions and measurement requirements, examples of Thermal, Hydel, and Nuclear plants. Thermal power plant and system instrumentation.	**6**
Module II : Instrumentation for 1) Turbines 2) Condensers 3) Generators 4) Coal handling 5) Water treatment 6) Feed water, combustion air and flue gases	**10**
Module III : Control Boiler Control - Steam pressure control, combustion control, Furnace Draft control, Steam temperature control, Feed water control, Data logger and computer control, supervisory control and monitoring system. Instrumentation for safety interlocks - protective gears, emergency measures, Alarm systems and Analysis etc. Pollution measurement, monitoring and control.	**8**

Module IV : Data handling-processing, logging, acquisition, accounting, display and storage. Instrumentation for Generator and Busbar coupling. Introduction to power plant modeling/simulation	**6**
	30

Text Books:

1. Principles of Industrial Instrumentation, D. Patranabis, TMH New Delhi

Reference Books:

1. Electric Power Engineering Handbook – Edited by L. L. Grigsby.
2. Instrument Engineers Handbook, B. G. Liptak, Chilton Book Co., Philadelphia

Mobile Communication
Code : EI 802A(EC)
Contacts : 3L
Credits : 3

Topic	No. of periods
Module I	
Introduction: Review of wireless communication and wave propagation, Multiple access schemes: FDMA, TDMA, CDMA, packet radio, radio telephony	8
Cellular communication system	4
Module II	
AMPS system: switching and networking	4
PCS services	2
Indoor and Outdoor propagation models	3
Pagers, GSM, GPRS, IS-95 systems	4
Module III	
Cordless telephony, PCN	3
Mobile computing	4
Wireless networks, LAN etc.	3
Module IV	
Mobile satellite communication	3
Wireless Access Protocol	3
Generation of Mobile communication - examples : 2G - 3G systems and future systems	5
	46

Books:

1. Schiller - Mobile Communication, Pearson Ed.
2. Garg - Wireless Network Evolution, Pearson Ed.

Embedded System
Code : EI 802B(EC)
Contacts : 3L
Credits : 3

Introduction to Embedded System : Embedded system Vs General computing systems, History of Embedded systems, Purpose of Embedded systems, Microprocessor and Microcontroller, Hardware architecture of the real time systems. [5]

Devices and Communication Buses: I/o types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Intrnet embedded system network protocols, USB, Bluetooth. [10]

Program Modelling Concepts ; Fundamental issues in Hardware software co-design, Unified Modelling Language(UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system. [5]

Real Time Operating Systems : Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS. [8]

Examples of Embedded System : Mobile phones, RFID, WISENET, Robotics, Biomedical Applications, Brain machine interface etc. Popular microcontrollers used in embedded systems, sensors, actuators. [6]

Programming concepts and embedded programming in C, C^{++}, JAVA. [4]

Ref:

1. Introduction to Embedded Systems : Shibu K. V. (TMH)
2. Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)
3. Embedded Systems : Rajkamal (TMH)
4. Embedded Systems : L. B. Das (Pearson)
5. Embedded System design : S. Heath (Elsevier)
6. Embedded microcontroller and processor design: G. Osborn (Pearson)

Digital Image Processing
Code : EI 802C(EC)
Contacts : 3L
Credits : 3

Objective: The course provides grounding in digital filter and transforms techniques for image processing and feature extraction, and an overview of common heuristic algorithms for Image Processing. The different representations of digital images, the importance of adequate sampling frequencies and the appearance of artifacts. Also how the important features in an image may be related to significant abstractions from the raw image. Prerequisite: Digital Signal Processing, Signals and Systems.

Module 1

Digital Image Processing Systems:

Introduction to structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationships between pixels. [4]

Module 2

Image Transforms (implementation):

Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen – Loeve (Hotelling) transform. [7].

Module 3

Image Enhancement in the Spatial and Frequency Domain:

Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters. Frequency domain filters: Homomorphic filtering. [6]

Module 4

Image Data Compression:

Fundamentals, Redundancies: Coding, Interpixel Psycho-visual, fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone Still Image compression standards, Video compression standards. [6]

Module 5

Morphological Image Processing:

Introduction, Dilation, Erosion, Opening, closing, Hit -or-miss transformation, Morphological algorithm operations on binary Images, Morphological algorithm operations on gray-scale Images. [6]

Module 6

Image Segmentation, Representation and Description: Detection of discontinuities, Edge linking and Boundary detection, Thresholding Region based segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors. [7]

Text Books:

1. R.C Gonzalez and R. Woods :-Digital Image Processing, (Indian reprint: Pearson publication, 2001)
2. Anil K. Jain :- Digital Image Processing (Prentice-Hall, India)

Reference Books:

1. W. K. Pratt :- Digital Image Processing, - 2nd Edition, (John Wiley & Sons).
2. B. Chanda & D. Dutta Majumder, Digital Image Processing and Analysis, (Prentice-Hall, India)
3. M. A. Sid-Ahmed :- Image Processing- Theory, Algorithms & Architecture, (McGraw-Hill).

PLANT AUTOMATION
Code : EI 802D(CH)
Contacts : 3L
Credits : 3

Topic	No of Periods
Module I : Recapitulation Basic Components and Functions of DCS, PLC, HMI (OS and ES); ISO/OSI Reference Model; TCP/IP Basics, Industrial Ethernet, Fieldbus, Network Access Protocols, Network Topology and Arbitration Methods; Computer Integrated Processing; OPC and OLE Connectivity	**4**
Module II : Plant Automation System network Elements of Plant Automation System (PAS) : Smart Sensors, Sensor networks, Intelligent actuators, SCADA systems, I/O Modules (wired and wireless), RTUs, AS-Interface. Safety Interlocks, Sequence Controls PAS network and typical system architecture using the above elements PAS developed into MES (manufacturing execution systems) integrated with high level software	**10**
Module III : ANSI/ISA95 Standard Energy Conservation and Management Application of Soft Computing techniques	**6**
Module IV : Automation Solutions PLC based systems HMI and SCADA based systems PC based automation systems	**6**
Module V : Case Study (any one) Paper Mill Power Plant Batch Process	**6**
	32

Books:

1) Process Automation Handbook : A Guide to Theory and Practice. J LOVE, Springer 2007
2) Overview of Industrial Process Automation, KLS Sharma, Elsevier, 2011
3) Automation Made Easy, P. G. Martin & H. Gregory, ISA, 2009
4) Industrial Automation, Circuit Design and components, D W Pessen
5) Serial Networked Field Instrumentation, JR Jordan, Wiley Series - Measurement Science and Technology
6) Springer Handbook of Automation

Practical

POWER ELECTRONICS LABORATORY
Code : EI 891A (EE)
Contacts : 3P
Credits : 2

1. Study of V-I Characteristics of an SCR and a TRIAC.
2. Study of Diode-Resistance, Diode-Resistance-Capacitance, Resistance-Capacitance and UJT Triggering Circuits for SCR.
3. Study of the operation of a single phase fully controlled bridge converter supplying R-L load and free wheeling diode, including generation of triggering pulses for the devices for both continuous and discontinuous modes of conduction.
4. Study of a self commutation circuit for commutating an SCR operating on a DC supply.
5. Simulation of DC to DC step down chopper.
6. Simulation of PWM bridge inverter using MOSFET/IGBT with R/R-L load.
7. Simulation of Single phase AC regulator.
8. Study of a control circuit for a stepper motor and its operation./ Study of a single quadrant chopper controlled PM dc motor.

INDUSTRIAL DRIVES LABORATORY
Code : EI 891B (EE)
Contacts : 3P
Credit: 2

1. Study of the characteristics of a DC motor
2. Study of methods of speed control of DC motor
3. Measurement of speed of DC series motor as a function of load torque.
4. Polarity test on a single phase transformer & study of different connections of three phase transformer.
5. Study of performance of three phase squirrel- cage Induction motor – determination of iron-loss, friction & windage loss.
6. Different methods of starting of a 3 phase Cage Induction Motor & their comparison [DOL, Auto transformer & Star-Delta]
7. Speed control of 3 phase squirrel cage induction motor by different methods & their comparison [voltage control & frequency control].
8. Speed control of 3 phase slip ring Induction motor by rotor resistance control.
9. Load test on single phase Induction motor to obtain the performance characteristics.
10. Load test on wound rotor Induction motor to obtain the performance characteristics.

POWER PLANT INSTRUMENTATION LABORATORY

Code : EI 891C (EE)
Contacts : 3P
Credit: 2

I **Simulation Experiments**

1. Single Element and Three Element Drum Level Control
2. Combustion Control
3. Steam Temperature Control
4. Boiler Management System and Boiler Start-up

II **Visit to Power Plants and submission of written report on the same**

INSTRUMENTATION & CONTROL DESIGN LABORATORY

Code : EI 892
Contacts : 6P
Credit : 4

The objective of this paper is to impart some idea about the approach to Instrumentation and control design with emphasis on compromise between design target and product quality & marketability. The above design lab is proposed to be carried out in the following manner :
A group of students will work under the guidance of one/two members of faculty. Introductory class(es) will be devoted to outlining the concept of complete design work - its contents (components, instruments, purpose & function of the specific design work taken up, specifications, etc.) and applications. Development of specification sheets, sizing calculations (for e.g orifice plate, control valve assembly, etc.,) and selection of instruments / components, Development of engineering drawings – like instrument hook-up drawings, loop and wiring drawings etc. to be prepared by students. Consulting hand books, reference books and manuals, manufacturers' catalogues etc., to be encouraged

1) Process Control Loop Design
   a. Flow Control
   b. Level Control

2) Choose : Controller type, parameters, final control element from specification sheets for a given process functions

3) Signal to data converter design including coding for different rate variation of signals

4) Corroborate with industry for training / adaptation of the design made in laboratory (software).

5) a. Sensor design and Simulation : specified sensor only
b. Actual sensor design (thick sensors/conventional sensors)
(Collaborate with JU/CGCRI Sensor hub)

6) Controller (digital) design (designing of processor i.e., program) for different process transfer function including dead time (Smith Predictor)

7) Design and fabrication of an instrument like
a. thermal conductivity analyser
b. piezo-electric accelerometer

8) Design of a. specified amplifier
b. counters (high frequency)

Reference Book :

Advanced Practical Process Control – Roffel B and Betlem B, Sringer Verlag
Instrument Engineers Handbook (Vol I, II and III), edited by B. G. Liptak, CRC Press