Syllabus for B.Tech(Electrical & Electronics Engineering) Second Year

Revised & Proposed Syllabus of B.Tech in EEE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

3rd Semester

Theory:

Sl. No.	CODE	Paper	Contacts periods Per weeks			Total Contact Hrs	Credits
			L	T	P		
1	M (CS) 301	Numerical Methods	2	1	0	3	2
2	M302	Mathematics-III	3	1	0	4	4
3	EC(EE)301	Analog Electronic circuits	3	0	0	3	3
4	EC(EE)302	Digital Electronic circuit	3	0	0	3	3
5	EE-301	Electric Circuit theory	3	1	0	4	4
6	EE-302	Field theory	3	1	0	4	4
						20	20

Practical / Sessional:

Sl. No.	CODE	Paper	Contacts periods Per weeks			Total Contact Hrs	Credits
			L	T	P		
1	EC(EE)391	Analog & Digital Electronic circuit	0	0	3	3	2
2	M (CS)391	Numerical Methods	0	0	2	2	1
3	EE-391	Electric Circuit Theory	0	0	3	3	2
4	HU-391	Technical report writing and language practice	0	0	3	3	2
		Total of Practical / Sessional				11	7
TOTAL OF SEMESTER:						32	27

4th Semester

Theory:

Sl. No.	CODE	Paper	Contacts periods Per weeks			Total Contact Hrs	Credits
			L	T	P		
1	HU-401	Values and Ethics in Profession	3	0	0	3	3
2	PH (EE)-401	Physics-II	3	1	0	4	4
3	EI(EEE)-401	Transducers & sensors	3	0	0	3	3
4	CH-401	Basic Environmental Engineering & Elementary Biology	3	0	0	3	3
5	EE-401	Electric Machine-I	3	1	0	4	4
6	EE-402	Electrical & Electronic measurement	3	1	0	4	3
						21	20

Practical / Sessional:

Sl. No.	CODE	Paper	Contacts periods Per weeks			Total Contact Hrs	Credits
			L	T	P		
1	PH(EE)-491	Physics-II Lab	0	0	3	3	2
2	EI(EEE)-491	Transducers & sensors Lab	0	0	3	3	2
3	EE-491	Electric Machine Lab-I	0	0	3	3	2
4	EE-492	Electrical & Electronic measurement Lab	0	0	3	3	2
		Total of Practical / Sessional				12	8
TOTAL OF SEMESTER:						33	28

Syllabus for B.Tech(Electrical & Electronics Engineering) Second Year

Revised & Proposed Syllabus of B.Tech in EEE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Third 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) $0 \le P(A) \le 1$, 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.

ELECTRIC CIRCUIT THEORY
EE-301

Credit: 4 **Contact: 3L+1T**

Module	Content	Hour
1	**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
2	**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
3	**Laplace transforms:** 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.	8

4	**Fourier method of waveform analysis:** Fourier series and Fourier Transform (in continuous domain only). Application in circuit analysis, Solution of Problems	8
5	**Network equations**: 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
6	**Graph theory and Networks equations:** Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials. Duality, Solution of Problems	4
7	**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	4
8	**Filter Circuits:** Analysis and synthesis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems	4

Text Books:

1. Networks and Systems, D. Roy Chowdhury, New Age International Publishers
2. Network Analysis and Synthesis, C.L. Wadhwa, New Age International Publishers
3. Circuit and Networks: Analysis and synthesis, A. Sudhakar & S.S. Palli 4th edition. Tata Mc Graw Hill Education Pvt. Ltd.
4. Circuit theory, Dr. Abhijit Chakrabarty, Dhanpat Rai & Co Pvt. Ltd.

Reference Books:

1. Network Analysis, M.E. Valkenburg, Pearson Education .
2. Fundamental of Electric circuit theory, D. Chattopadhay & P.C. Rakshit, S. Chand.
3. Engineering Circuit Analysis, W.H. Hyat, J.E. Kemmerly & S.M. Durbin, The Mc Graw Hill Company.
4. Electric Circuit, M. Nahvi & J.A. Edminister, Schum's outline series, The Mc Graw Hill Company.
5. Electric Circuit Analysis, S. Sivanagaraju, G. Kishor, C.Srinivasa Rao, Cengage Learning
6. Fundamental of Electric Circuits, Charles K. Alexander, Mathew. N.O. Sadiu, Tata Mc Graw Hill Educaton.
7. Engineering Circuit Analysis, W.H. Hayt, J.E. Kemmerly, S.M. Durbin, The Mc Graw Hill Companies
8. Introduction to Electric Circuits, Richard C. Dorf, James A. Svoboda, Wiley India Edition.
9. Electric Circuits, Syed A. Nasar, Schaum's solved problem series, Tata Mc Graw Hill Publishing Company Limited.

FIELD THEORY
EE-302

Credit: 4 **Contact: 3L+1T**

Module	Content	Hour
1	**Introduction:** Co-ordinate systems and transformation, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems. Solution of problems	3

2	**Introduction to Vector calculus:** DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Strokes theorem, Laplacian of a scalar, Classification of vector fields, Helmholtz's theorem. Solution of problems	3
3	**Electrostatic field:** Coulomb's law, field intensity, Gauss's law, Electric potential and Potential gradient, Relation between E and V, an Electric dipole and flux lines. Energy density in electrostatic field. Boundary conditions: Dielectric-dielectric, Conductor –dielectric, Conductor-free space. Poisson's and Laplace's equation, General procedure for solving Poisson's and Laplace's equation. Solution of problems	8
4	**Magneto static fields:** Biot- savart law, Ampere's circuit law, Magnetic flux density, Magnetic static and Vector potential, Forces due to magnetic field, Magnetic torque and moments, Magnetisation in material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy, Force on magnetic material. Solution of problems	8
5	**Electromagnetic fields:** Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Time varying Potential, Time harmonic fields. Solution of problems	5
6	**Electromagnetic wave propagation:** Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect, Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Polarisation. Solution of problems	6
7	**Transmission line:** Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions, Propagation constants, Characteristic impedance, Wavelength, Velocity of propagation. Solution of problems	4

Text Books:

1. Elements of Electromagnetic, Mathew N.O. Sadiku, 4th edition, Oxford university press.
2. Engineering Electromagnetic, W.H. Hyat & J.A. Buck, 7th Edition, TMH
3. Theory and problems of Electromagnetic, Edminister, 2nd Edition, TMH
4. Electromagnetic field theory fundamentals, Guru & Hizroglu, 2nd edition, Cambridge University Press.

Reference Books:

1. Electromagnetic with application, Krause, 5th Edition, TMH.
2. Elements of Engineering Electromagnetic, N.N. Rao, 6th Edition, Pearson Education.

DIGITAL ELECTRONICS CIRCUITS
EC (EE)-302

Credit: 3 **Contact: 3L**

Module	Content	Hour
1	**Data and number system:** Binary, Octal and Hexadecimal representation and their conversion, BCD, ASCII, EBDIC, Gray codes and their conversion, Signed binary numbers representation with 1's and 2's complement methods, Binary arithmetic.	5

2	**Boolean algebra:** Various logic gates and their truth tables and circuits, Representation in SOP and POS forms, Minimization of logic expressions by algebraic method, K-map method.	5
3	**Combinational circuits:** Adder and sub tractor circuit, Circuit of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and parity Generator.	5
4	**Memory systems:** RAM, ROM, EPROM, EEROM	4
5	**Sequential circuits:** Basic memory elements, S-R, J-K, D, and T Flipflop, various types of Registers, Counters & their design, Irregular counter, State table & State transition diagram, Sequential circuit design methodology.	6
6	**Different types of A/D and D/A conversion techniques.**	4
7	**Logic families:** TTL, ECL, MOS & CMOS, their operation and specification.	5

Text Books:

1. Digital Principles & Application, 5th Edition, Leach & Malvino, Mc Graw Hill Company.
2. Digital Fundamentals, 8th Edition, Floyd & Jain. Pearson Education.
3. Fundamental of Digital Circuits, A. Anand Kumar, PHI.

Reference Books:

1. Digital Logic Design, Morries Mano, PHI.
2. Digital Integrated Electronics, H. Taub & D. Shilling, Mc Graw Hill Company.
3. Digital Electronics, James W. Bignell & Robert Donovan, Thomson Delman Learning.
4. Fundamental of logic Design, Charles H. Roth, Thomson Delman Learning.

ANALOG ELECTRONIC CIRCUITS
EC (EE)-301

Credit: 3 **Contact: 3L**

Module	Content	Hour
1	**Filters & Regulators:** Capacitor filters, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation, Concept of SMPS.	4
2	**Transistor biasing & stability:** Q point, Self Bias-CE, Compensation techniques, h-model of Transistor, Expression of voltage gain, current gain, input & output impedance, Trans-resistance & Trans-conductance, Emitter follower circuits, High frequency model of Transistor.	5
3	**Transistor amplifier:** RC coupled amplifier, Function of all components, Equivalent circuit, derivation of voltage gain, Current gain, Input impedance & output impedance, Frequency response characteristics, Lower & upper half frequencies, Bandwidth, Concept of Wide band amplifier.	5
4	**Feed back amplifier & Oscillators:** Concept of Feed back, Negative & Positive feedback, Voltage/Current, Series/Shunt feedback, Berkhausen criterion, Colpit , Hartley's, Phase shift, Wien bridge, & Crystal oscillators.	4
5	**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 circuits.	5
6	**Application of Operational amplifiers:** Adder, Integrator & Differentiator, Comparator, Schmitt Trigger, Instrumentation Amplifier, Log & Antilog amplifier, Trans-conductance multiplier, Precision rectifier, Voltage to current & Current to voltage converter.	5
7	**Power amplifier:** Class A, B, AB, C, Conversion efficiency, Tuned amplifier.	4

8	**Multivibrator:** Monostable, Bistable multivibrator, Monostable & Astable operation using 555 timer.	2
9	**Special function circuits:** VCO & PLL	2

Text Books:

1. Microelectronic Circuits, Sedra & Smith, Oxford University Press.
2. Integrated Electronics, Milman & Halkias, Mc Graw Hill Company.
3. Electronic devices & Circuits, Balbir Kumar & Shail B. Jain, PHI.
4. Op-amps and Linear IC's, R.A. Gayakwad, PHI.

Reference Books:

1. Microelectronic Circuit- Analysis & Design, Rashid, Cenage Learning.
2. Electronic Circuits: Discrete & Integrated, 3rd Edition, Schilling & Belove, Mc Graw Hill Company.
3. Electronic principles, 6th Edition, Malvino, Mc Graw Hill Company.
4. Operational Amplifier & Linear IC's, Bell, Oxford University Press.
5. 2000 Solved Problems in Electronics, Jimmie J. Cathey, Mc Graw Hill Inc.
6. Electronic Devices -System & Application, Robert Diffenderfer, Cengage Learning.
7. Op- Amps & Linear Integrated Circuits, Ravi Raj Dudeja & Mohan Dudeja, Umesh Publication.

Practical

ELECTRIC CIRCUIT THEORY LABORATORY
EE-391

Credit: 2 **Contact: 3**

1. Transient response of R-L and R-C network: simulation with PSPICE /Hardware
2. Transient response of R-L-C series and parallel circuit: Simulation with PSPICE/ Hardware
3. Determination of Impedance (Z) and Admittance (Y) parameter of two port network: Simulation / Hardware.
4. Frequency response of LP and HP filters: Simulation / Hardware.
5. Frequency response of BP and BR filters: Simulation /Hardware.
6. Generation of Periodic, Exponential, Sinusoidal, Damped Sinusoidal, Step, Impulse, Ramp signal using MATLAB in both discrete and analog form.
7. Determination of Laplace transform and Inverse Laplace transform using MATLAB.
8. Amplitude and Phase spectrum analysis of different signals using MATLAB.
9. Verification of Network theorem using SPICE

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.

ELECTRIC CIRCUIT THEORY LABORATORY
EC (EE)-391

Credit: 2 **Contact: 3**

1. Study of Ripple and Regulation characteristics of full wave rectifier with and without capacitor filter.
2. Study of Zener diode as voltage regulator.
3. Construction of two stage R-C coupled amplifier & study of its gain and Bandwith.
4. Study of class A, C & Push pull amplifier.
5. Realisation V-I & I-V converter using Operational Amplifier.
6. Study of timer circuit using NE 555 and configuration of Monostable and Astable Multivibrator.
7. Study of DAC & ADC
8. Realisation of basic gates using Universal logic gates.
9. Realisation of RS-JK & D filpflop using logic gates.
10. Design of Combinational circuit for BCD to decimal conversion to drive 7-segment display using Multiplexer.
11. Realisation of Synchronous Up/Down counter.
12. Construction of simple Decoder & Multiplexer circuits using logic gates.
13. Construction of adder circuit using Shift register & Full adder.

PAPER NAME : TECHNICAL REPORT WRITING & LANGUAGE LABORATORY PRACTICE
PAPER CODE: HU 381
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

Fourth 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.

PHYSICS-II
PH (EE)-401 4:Physics
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. 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).	3 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.	1 2 2 3

• 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.	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

TRANSDUCERS & SENSORS

EI (EEE)-401 Credit-3 3L+1T

Module-I

Definition, principle of sensing & transduction , classification	1
Mechanical and Electromechanical sensor	1
• Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity.	2
• Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes.	2
• Inductive sensor: common types- Reluctance change type, Mutual inductance change type, transformer action type, Magnetostrictive type, brief discussion with respect to material, construction and input output variable, Ferromagnetic plunger type, short analysis.	3
• LVDT: Construction, material, output input relationship, I/O curve, discussion.	2
• Proximity sensor.	1

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 sensitivity.	3
• Stretched diaphragm type: microphone, response characteristics.	2
• Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.	3

Module-III

Thermal sensors:	
• Material expansion type: solid, liquid, gas & vapor	2
• Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermister material, shape, ranges and accuracy specification.	3
• Thermoemf sensor: types, thermoelectric power, general consideration,	1
• Junction semiconductor type IC and PTAT type.	
• Radiation sensors: types, characteristics and comparison.	2
• Pyroelectric type	2 1

Module-IV

Magnetic sensors:	
• Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics.	4
• Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive cell-types, materials, construction, response.	2
• Geiger counters, Scintillation detectors.	2
Introduction to smart sensors	1

Text books:

1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A.Doebelin, Mc Graw Hill.

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.

ELECTRIC MACHINE-I

EE-401 Credit: 4 3L+1T

Topic	No of periods
Module-I	
• Electromechanical Energy Conversion Principle, Singly Excited Magnetic System and Doubly Excited Magnetic system. Physical concept of torque production; Electromagnetic torque and Reluctance torque.	2
• Concept of General terms pertaining to Rotating Machines: Electrical & Mechanical degree, Pole pitch, Coil, Generated EMF in full pitched coil, Generated EMF in a short pitched coil, EMF polygon,	2
• Distribution factor, Pitch factor. MMF produced by Distributed Windings, MMF of a coil, MMF of single phase distributed Winding, MMF waveform of Commutator machines.	2
Module-II	
DC Machines:	
• EMF generated in the armature. Methods of Excitation, Armature reaction & its effect in the performance, Methods of decreasing the effects of Armature reaction, Effect of Brush shift.	3
• Commutation process, Resistance commutation, Delayed commutation, Voltage commutation, Improvement of Commutation.	2
• Operating Characteristics of DC Generators: Separately Excited generators,	

Shunt Generators, Series Generators and Compound Generators.	2
• Torque equation of D.C motor, Operating Characteristics of Shunt, Series & Compound motors.	2
• Losses and efficiency of DC machines, Hopkinson's and Swinburne's test.	2
• D.C Machine application: Generator application, Motor application	1

Module-III

3-Phase Induction machine:	
• Induction motor as a Transformer, Flux and MMF phasors in Induction motors,	1
• Equivalent circuit, Performance equations, Induction motor phasor diagram	2
• Toque-slip characteristic, Power slip characteristic, Determination of equivalent circuit parameters.	2
• Methods of starting of squirrel Cage and Wound rotor Motors.	1
• Speed control of Induction motor	2
• Polarity Test, Application of Polyphase Induction motor.	1

Module-IV

3-Phase Transformer:	
• Determination of polarity and connections (star/star, star/delta, delta/star, star/zigzag, delta/zigzag, open delta), Phasor groups.	3
• Effect of unbalanced loading, Production of Harmonics in Transformer and its suppression,	1
• 3 phase to 2 phase transformation, Scott connection, 3 phase to 6 phase connections, Double star and Double delta,	3
• 3 winding transformer: Parameter estimation, application,	2
• Parallel operation of Transformers, Introduction to Tap changing transformer and its function.	2
• **Special Transformers:** Potential transformer, Current transformer, Pulse transformer, Audio frequency transformer, Grounding transformer, Pulse transformer.	2

Numerical Problems to be solved in the tutorial classes.

Text Books:

1 Electrical Machinery, P.S. Bhimra, 6th Edition, Khanna Publishers.
2 Electric machines, D.P. Kothari & I.J Nagrath, 3rd Edition, Tata Mc Graw-Hill Publishing Company Limited.
3 Electrical Machines, P.K. Mukherjee & S. Chakrabarty, Dhanpat Rai Publication.

Reference Books:

1. Electric Machinery & Transformers, Bhag S. Guru and H.R. Hiziroglu, 3rd Edition, Oxford University press.
2. Electrical Machines, R.K. Srivastava, Cengage Learning
3. Theory of Alternating Current Machinery, Alexander S Langsdorf, Tata Mc Graw Hill Edition.
4. The performance and Design of Alternating Current Machines, M.G.Say, CBS Publishers & Distributors.
5. Electric Machinery & transformer, Irving L Koskow, 2nd Edition, Prentice Hall India

ELECTRICAL & ELECTRONIC MEASUREMENT

EE-402 Credit: 3 3L+1T

Topic	No of periods
Module-I	
Measurements: • Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments. **Analog meters:** • General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments • Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.	3 3 3
Module-II	
Instrument transformer: • Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors. **Measurement of Power:** • Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors. **Measurement of resistance:** • Measurement of medium, low and high resistances, Megger.	4 3 4
Module-III	
Measurement of Energy: • Construction, theory and application of AC energy meter, testing of energy meters. **Potentiometer:** • Principle of operation and application of Crompton's DC potentiometer, Polar and Co-ordinate type AC potentiometer. Application. **AC Bridges:** • Measurement of Inductance, Capacitance and frequency by AC bridges.	3 4 4
Module-IV	
Cathode ray oscilloscope (CRO): • Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO. **Electronic Instruments:** • Advantages of digital meter over analog meters, Digital voltmeter, Resolution	3

and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.	4
Sensors & Transducers:	
• Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.	3

Numerical Problems to be solved in the tutorial classes.

Text Books:

1. A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & sons.
2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing.
3. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.

Reference Books:

1. Sensors & Transducers, D. Patranabis, PHI, 2nd edition.
2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill.
3. Modern Electronic instrumentation & Measuring instruments, A.D. Heltric & W.C. Copper, Wheeler Publication.
4. Instrument transducers, H.K.P. Neubert, Oxford University press.

Practical

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.

TRANSDUCERS & SENSORS LABORATORY

EI (EEE)-491 Credit-2 3P

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

ELECTRIC MACHINE LABORATORY-I

EE-491 Creidit: 2 3P

1. Study of the characteristics of a separately excited DC generator.
2. Study of the characteristics of a DC motor
3. Study of methods of speed control of DC motor
4. Study of the characteristics of a compound DC generator (short shunt).
5. Measurement of speed of DC series motor as a function of load torque.
6. Study of equivalent circuit of a single phase transformer.
7. Polarity test on a single phase transformer & study of different connections of three phase transformer.
8. Study of equivalent circuit of three phase Induction motor by no load and blocked rotor test.
9. Study of performance of wound rotor Induction motor under load.
10. Study of performance of three phase squirrel- cage Induction motor –determination of iron-loss, friction & windage loss.

Reference Books:

1. Laboratory experiments on Electrical machines, C.K. Chanda, A. Chakrabarty, Dhanpat Rai & Co.

ELECTRIC AND ELECTRONIC MEASUREMENT LABORATORY

EE-492 Credit: 2 3P

List of Experiments:

1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electrothermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.
2. Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer.
3. Calibrate dynamometer type wattmeter by potentiometer.

4. Calibrate AC energy meter.
5. Measurement of resistance using Kelvin double bridge.
6. Measurement of power using Instrument transformer.
7. Measurement of power in Polyphase circuits.
8. Measurement of frequency by Wien Bridge.
9. Measurement of Inductance by Anderson bridge
10. Measurement of capacitance by De Sauty Bridge.
11. Measurement of capacitance by Schering Bridge.