UNIVERSITY OF CALICUT

Scheme and Syllabi for the Combined I&II Semester of
Bachlor of Technology
From 2004 Admission onwards

EE : ELECTRICAL AND ELECTRONICS ENGINEERING

COMBINED FIRST AND SECOND SEMESTER

Code	Subject	Hours/Week			Internal Marks	University Examination	
		L	T	P/D		Hrs	Marks
EN04- 101	Engineering Mathematics I	3	-	-	50	3	100
EN04- 102	Engineering Mathematics II	3	-	-	50	3	100
EN04- 103A	Engineering Physics(A)	2	-	-	50	3	100
EN04- 103A(P)	Physics Lab(A)	-	-	1	25	-	-
EN04- 104A	Engineering Chemistry(A)	2	-	-	50	3	100
EN04- 104A(P)	Chemistry Lab(A)	-	-	1	25	-	-
EN04- 105	Humanities	2	-	-	50	3	100
EN04- 106A	Engineering Graphics(A)	1	-	3	50	3	100
EN04- 107A	Engineering Mechanics(A)	2	1	-	50	3	100
EE04- 108	Mechanical Engineering –I	2	-	-	50	3	100
EE04- 109	Basic Electrical Engineering	2	-	-	50	3	100
EE04- 110(P)	Civil and Mechanical Workshop	-	-	3	50	-	-
EE04- 111(P)	Electrical and Electronics workshop	-	-	2	50	-	-
TOTAL		**19**	**1**	**10**	**600**	**-**	**900**

EN04- 101 : MATHEMATICS I

(common for all B. Tech. programmes)

3 hours lecture per week

Module I: Differential Calculus (15 hours)

Indeterminate forms - L` hospital`s rule - radius of curvature - centre of curvature - evolute - functions of more than one variable - idea of partial differentiation - Euler`s theorem for homogeneous functions - chain rule of partial differentiation - applications in errors and approximations - change of variables - Jacobians - maxima and minima of functions of two - method of Lagrange multipliers.

Module II: Infinite Series (15 hours)

Notion of convergence and divergence of infinite series - ratio test - comparison test - Raabe`s test - root test - series of positive and negative terms - absolute convergence - test for alternating series - power series - interval of convergence - Taylors and Maclaurins series expansion of functions - Leibnitz formula for the n^{th} derivative of the product of two functions - use of Leibnitz formula in the Taylor and Maclaurin expansions

Module III: Matrices (21 hours)

Rank of a matrix - reduction of a matrix to echelon and normal forms - system of linear equations - consistency of linear equations - Gauss` elimination - homogeneous linear equations - fundamental system of solutions - solution of a system of equations using matrix inversion - Eigen values and eigen vectors - Cayley-Hamilton theorem - Eigen values of Hermitian, skew-Hermitian and unitary matrices- Diagonalisation of a matrix using Eigen values and Eigen

vectors- quadratic forms- matrix associated with a quadratic form- definite, semidefinite and indefinite forms.

Module IV: Fourier series and harmonic analysis (15 hours)
Periodic functions - trigonometric series - Fourier series - Euler formulae - even and odd functions - functions having arbitrary period - half range expansions - approximation by trigonometric polynomials - minimum square error - numerical method for determining Fourier coefficients - harmonic analysis

Reference books

1. Michael D. Greenberg, Advanced Engineeing Mathematics(second edition), Pearson Education Asia.
2. Wylie C.R. and L.C. Barrent, *Advanced Engineering Mathematics* , McGraw Hill
3. Kreyszig E., *Advanced Engineering Mathematics* , Wiley Eastern
4. Piskunov N., *Differential and Integral calculus* , MIR Publishers
5. Ayres F., *Matrices* , Schaum's Outline Series, McGraw Hill
6. Sastry, S.S., Engineering Mathematics-Vol.1 and2., Prentice Hall of India

Internal work assessment
60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN04-102 : MATHEMATICS II

(common for all B. Tech. programmes)

3 hours lecture per week

Module I: Ordinary differential equations (21 hours)
Equations of first order - separable, homogeneous and linear types - exact equations - orthogonal trajectories - linear second order equations - homogeneous linear equation of the second order with constant coefficients - fundamental system of solutions –Solutions of the general linear equations of second order with constant coefficients- method of variation of parameters - Cauchy's equation - simple applications of differential equations in engineering problems, including problems in mechanical vibrations, electric circuits and bending of beams

Module II: Laplace transforms (15 hours)
Gamma and Beta functions - definitions and simple properties - Laplace transform - inverse transform - Laplace transform -shifting theorems-Transforms of derivatives and integrals - differentiation and integration of transforms - transforms of unit step function and impulse function - transform of periodic functions - solution of ordinary differential equations using Laplace transforms

Module III: Vector differential calculus (15 hours)

Vector function of single variable - differentiation of vector functions - scalar and vector fields - gradient of a scalar field - divergence and curl of vector fields - their physical meanings - relations between the vector differential operators

Module IV: Vector integral calculus (15 hours)

Double and triple integrals and their evaluation - line, surface and volume integrals - Green`s theorem - Gauss` divergence theorem - Stokes` theorem (proofs of these theorems not expected) - line integrals independent of the path

Reference books

1. Michael D. Greenberg, Advanced Engineeing Mathematics(second edition), Pearson Education Asia.
2. Wylie C.R. and L.C. Barrent, *Advanced Engineering Mathematics* , McGraw Hill
3. Kreyszig E., *Advanced Engineering Mathematics* , Wiley Eastern
4. Piskunov N., *Differential and Integral calculus* , MIR Publishers
5. Ayres F., *Matrices* , Schaum's Outline Series, McGraw Hill
6. Sastry, S.S., Engineering Mathematics-Vol.1 and2., Prentice Hall of India

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Total marks = 50

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Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN04- 103A : ENGINEERING PHYSICS(A)

(common for AI, CS, EE, EC, IT, IC, BM,BT, PT)

2 hours lecture per week

Module I (11 hours)

Semi conductor Physics- Formation of energy bands in solids- Classification of solids on the basis of energy band gap-Intrinsic and extrinsic semiconductors- Elemental and compound Semiconductors- Fermi level in intrinsic semiconductor- Electron and hole concentrations in intrinsic semi conductor in thermal equilibrium- Law of mass action-Electrical conductivity of intrinsic semiconductor- Fermi level in n-type and p-type semiconductors- Electrical conductivity of extrinsic semi conductor- Diffusion and total current.

Application of semi conductors- Band model of p-n junction- Junction diode and its characteristics- characteristics of a transistor in common emitter configuration- Input, output resistance and current amplification factor- Light emitting diode, photo diode,solar cell, photo resistor (LDR),photo transistor, liquid crystal display(LCD) and zener diode- Avalanche and zener breakdown- Application of zener diode as a voltage regulator.
Hall effect in semiconductors- Derivation of Hall coefficient-Determination of Hall coefficient by measuring Hall voltage-Applications of Hall effect

Super conductivity- Properties of super conductors (critical magnetic field,Meisnner effect, critical current,flux quantisation)- Types of super conductors- BCS theory of super conductivity (qualitative)-Josephon's effect- Theory of d.c. Josephon's effect- SQUID - Applications of super conductivity

Module II (11 hours)

Interference of light- Interference due to division of amplitude- Interference from plane parallel thin films- Colours of thin films in reflected and transmitted light- Newton's rings- Meaurement of wavelength and refractive index- Thin wedge shaped film- Air wedge- Testing of optical planeness of surfaces.

Interferometry- Michelson's interferometer –Types of fringes- Visibility of fringes-Application of Michelson's interferometer in determination of wavelength of monochromatic light, resolution of spectral lines and refractive index of gases.

Diffration of light-Introduction of Fresnel and Fraunhoffer class of diffraction and their distinction- Fresnels diffraction and rectilinear propogation of light-Diffraction pattern due to straight edg and expression for intensity maximum and minimum- Fraunhoffer diffraction – Simple theory of diffraction grating, its construction and working- Rayleigh's criteria. for resolution of spectral lines- Resolving power and dispersive power of grating.

Module III (11 hours).

Poarisation of light- Double refraction- Huygen's explanationof double refraction in uniaxial crystals-Positive and negative crystals- Nicol prism, construction and working –Quarter and half wave plates- Theory of circularly and elliptically polarised light, their production and detection-Rotatory polarisation- Laurent's half shade (brief explanation)- Laurent's half shade polarimeter-Applications of polarised light.

Laser physics- Basic concepts and properties of laser- Spontaneous and stimulated emission-Expression for ratio of their coefficients- Absorption,-population inversion and optical pumping-Construction and components of a laser-Ruby,Helium and Neon and semiconductor lasers-Applicattion of lasers.

Basic principle of holography and its application.

Fibre optics- Basic principle –fibre dimensions and construction- Step index single mode and multi mode fibre- Graded index fibre-Numerical aperature and acceptance angle- Signal distortion in optical fibres and transmission losses(brief ideas only)- optic fibre communication (block diagram) and it's advantages- Applications of optic fibres.

Module IV (11 hours).

Planck's quantum theory- Absorbing power, reflecting power and transmitting power of a body or surface- Perfect black body- Distribution energy in the spectrum of a black body- Wein's displacement law- Planck's hypothesis- Derivation of Planck's law of radiation.

Quantum mechanics- Distinction between Newtonian and quantum mechanics- Schroedinger wave equation for free particle –Potential in schrodinger equation –Time dependant and time independant schroedinger equations and their derivations- Expectation values- Applications-Particle in a box (motion in one dimension).

Ultrasonics- Piezo electric effect- Piezo electric crystal- Production of ultrasonics by piezo-electric oscillater- Detection of ultrasonics – General properties and applications of ulltrasonics – Ultrasonic diffractometer and determination of velocity of ultrasonics in a liquid.

Text book

1. Sreenivasan M .R, *Physics for Engineers* , New Age International
2. Vasudeva A.S; *Modern Engineering Physics* , S. Chand
3. S.O. Pillai, *Solid state physics,* New Age International

Reference books

4. Tyagi, M.S. *Introduction to semi conductor materials and de* vices, John Wiley and Sons
5. Mayer, *Intoduction to classical a nd modern optics* , Arendt
6. John Senior, *Fibre optic communiction*
7. G Aruldhas *Quantum mechanics* Prentice Hall of India
8. Murukesan R. *Modern Physics* –-S.Chand and Co
9. Brijlal and Subrahmanyam N, *Text book of Optics* , S.Chand
10. Kale Gokhale; *Fundamentals of Solid State Electronics* , Kitab Mahal
11. Gupta S.L. and Kumar, V; *Solid State Physics* , K.Nath

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

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Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN04- 103A(P) : PHYSICS LAB(A)

(common for AI, EE, EC, IC, BM, BT)

1 hour lab per week or 2 hours lab per alternate weeks

1. Band gap energy in a semi conductor using a reverse biased p-n junction.
2. Static characteristcs of a transistor (p-n-p or n-p-n)in common emitter configuration.
3. Characteristics of a Zener diode
4. Characterisitics of a LED.and wave length of emitted radiation
5. Characterisitc of a photo diode.
6. Characterisitic of a photo resistor (LDR)
7. Voltage regulation using Zener diode
8. Wavelength of mercury spectral lines using diffraction grating and spectrometer.
9. Refractive indices of ordinary and extra ordinary rays in calcite or in quarts prisms.
10. Wave length of sodium light by Newton's rings method.
11. Diameter of a thin wire or thickness of a thin paper by air wedge method.
12. Specific rotatory power of cane sugar solution using polarimeter.
13. Frequency of an electrically maintained tuning fork(transverse and longitudinal mode)
14. Wave length and velocity of ultrasonic waves using ultrasonic difractometer.
15. Divergence of laser beamsusing He-Ne laser or diode laser
16. Wave length of laser using transmission grating.
17. Resolving and dispersive power of a grating .
18. Wave length of a monochromatic light by straight edge using laser beam.
19. Characterics of a solar cell.
20. Planck's constant using photo-electric cell or solar cell
21. Hall coefficient by measuring Hall voltage in a semi conductor.
22. Measurement of numerical aperature , acceptance angle and attenuation in an optical fibre.
23. Measurement of displacements using optic fibre.
24. Michelson's inerfeometer-determination of wavelength of a monochromatic source, resolution of spectral lines and refractive index. of a gas.

(Any 12 experiments should be done)

Reference Books:-

1 " Practical Physics with viva voice"- Dr. S.L.Guptha and Dr.V Kumar- Publishers- Pragati Prakashan.

2 " Experiments in Engineering Physics"- M.N. Avadhanulu, A.A.Dani, and R.M.Pokley- Publishers- S. Chand.

Internal work assessment

Lab practicals and record	= 15
Test/s	= 10
Total marks	= 25

EN04- 104A : ENGINEERING CHEMISTRY(A)

(common for AI, CS, EE, EC, IT, IC, BM, BT, PT)

2 hours lecture per week

SECTION-1

CHEMISTRY OF ENGINEERING MATERIALS:
Module 1(13 Hours)

Solids: Classification of solids with examples– (Crystalline – Polycrystalline – Amorphous – Partially melted solids – (KCN) – Super cooled liquids – (Glass) – liquid crystals.) (1Hour)

Crystalline state: Steno's law – Internal structure – Space lattices - Crystallographic axes- Law of rational indices-Crystal systems – Elements of symmetry – X-ray study- Braggs equation (derivation) single crystal and powder method –(Debye-Scherrer Camera) Cubic systems – structure elucidation - $\mathbf{d_{100}:d_{110}:d_{111}}$ ratio (problems to be worked out) – crystal imperfections(point-line-surface-volume -burgers vector- dislocations- edge and screw) Physical properties, bonding characteristics and Structure relation of– (Covalent solids – Ionic solids – metals) – metallic bonding- Stacking of atoms- (ABCABC….), (ABAB……)-tetrahedral and octahedral voids-Alloys – Hume Rothery rule-Conductivity – Resistivity –(Free electron theory– explanation with Fermi-Dirac statistics)– Fermi level –Applications of conductors-(transmission lines-OFHC Copper, ACSR, Contact materials, Precision resistors- heating elements-Resistance thermometers)- Super Conductors (type I and II-examples) (5 Hours)

Semi conductors – Band theory-(MOT) Valence band-Conduction band-intrinsic and extrinsic semiconductors-Fabrication of semiconductor materials-Crystal Growth-ultra pure Silicon production-zone refining-Fabrication of Integrated Circuits (IC) (2Hours)

Dielectric materials-Polarization – Ferro-electricity – Piezoelectricity – Applications with examples- Introduction to Nano Science –Carbon nano tubes and nanowires (1Hour)

Non-crystalline state – glass - properties – (applications- conducting glasses – solid supported liquids (stationary phases in reverse phase chromatography)- Optical fibre (1Hour)

Liquid crystals- Characterization- Nematic phases-Smectic Phases-Cholesteric Phases- Columnar Phases- Chemical Properties-thermotropic-lyotropic-epitaxial-growth-Freedericksz transition-applications –Liquid crystal thermometers- LCD displays (3 Hours)

Ref:

J. D. Lee (1996) "Concise Inorganic Chemistry" Chapman and Hall Ltd. London, pp-1032
S.Glasstone (1997) "Textbook of Physical Chemistry" Macmillan, New Delhi, pp-1320
P.W.Atkins (1987) "Physical Chemistry" Oxford University Press, Oxford, pp-857
P.W.Atkins and J.Depaula (2001) " Physical Chemistry" W.H.Freeman and Co, pp-1000
V.Raghavan (2000) "Material Science and Engineering-A First Course" Fourth edition, Prentice-Hall of India Pvt.Ltd , New Delhi, pp-485

L.H.Van Vlack (1998) "Elements of Materials Science and Engineering" Sixth edition, Addison-Wesley , London pp-598

J.W.Goodby (1997) "Chemistry of liquid crystals" VCH Publishing,pp-400.

K.W.Kolasinski (2002) "Surface Science: Foundations of Catalysis and Nano science" John-Wiley and Sons, pp-326

K.J.Klaubunde (2001) "Nano scale Materials in Chemistry" Wiley-Interscience,pp-304.

J.I.Gersten and F.W.Smith (2001) " The Physics and Chemistry of Materials" Wiley-Interscience, pp-856

Module2 (13 Hours)

High Polymers and Lubricants- Classification of Polymers-(Natural and Synthetic, Organic and Inorganic, Thermoplasic and Thermosetting, Plastics, Elastomers, Fibres and liquid resins) Polymerization (Chain polymerization Polythene- PVC- Teflon –polystyrene -poly-methylmethacrylate) Condensation polymerization(Polyamide and Polyesters) Co-polymerization (Buna-S, Buna-N, PVC- Co-polyvinylacetate, PAN-Co-polyvinyl Chloride),Coordination polymerization (Ziegler- Natta Polymerization)-Electrochemical Polymerization- Metathetical Polymerization-Group transfer Polymerization (3 Hours)

Mechanism of polymerization (Cationic, anionic, and free radical).Polymerization techniques(Bulk polymerization, Solution polymerization, Suspension polymerization, Emulsion polymerization, Melt polycondensation, Solution polycondensation, Interfacial condensation, Solid and Gas Phase Polymerization (2 Hours)

Structure relation to properties(Chemical resistance, Strength, Plastic deformation, Extensibility, Crystallinity) -Mol.Wt of Polymers-Number average Molecular wt, Weight average Mol.wt- Gel Permeation Chromatography (1 Hour)

Thermosetting resins (Bakelite, Urea-Formaldehyde, Silicones), Thermoplastic resins (Acrylonitrile, PVC, PVA ,PS, PMMA, PE).-Fibres (Nylon6, Nylon66,Nylon6,10, Cellulose fibres, dacron, Kevlar) Application of polymers in electronic and electrical industry. Elastomers-Natural rubber-Structure-Vulcanization-Synthetic rubbers (Neoprene, Buna-S, Buna-N, thiokol, Silicone rubber) (3 Hours)

Compounding of Plastics (Fillers, Plasticizers, lubricants, pigments, antioxidants, Stabilizers) and Fabrication (Calendering, Die Casting, Film casting, Compression, injection, Extrusion and Blow moulding , Thermoforming, Foaming, Reinforcing) (1 Hour)

Lubricants: Theory of friction – mechanisms of lubrication –Fluid film or hydrodynamic, thin film or boundary lubrication, extreme pressure lubrication-Classification of Lubricants-(Liquid(animal and vegetable oils, Petroleum oils),Semi-solid (Ca-soap grease, Li-soap grease, Al-soap grease, Axle grease) Solid lubricants (Graphite, Molybdenum di-sulphide- Structure relation to lubrication property) and synthetic lubricants (Di-basic acid esters, Poly glycol ethers, Organo phosphates, Organo silicones)). Properties of Lubricants (Viscosity index, Cloud point and pour point, flash point and fire point, Corrosion stability, Emulsification, Aniline point). Additives and their functions (Fatty acids, Sulphurised fats, Phenols, Calcium sulphonates, Organo-metallics, Hexanol, Amine phosphates, Tricresyl phosphates, Silicon polymers) (3 Hours)

Ref:

B.R.Gowariker et.al (2002) "Polymer Science" New Age International pp-505
B.W.Gonser et.al (1964) " Modern Materials-advances in development and application" Vol 1-7, Academic Press, New York.

Module -3 (9 Hours)

Electrochemistry: Single Electrode potential (theory – Nernst equation, derivation from thermodynamic principles) – types of electrodes ($M|M^{+}$, $M|MA|A^{-}$, $M|A^{+},A^{+2,}$ $Pt|H_2|H^{+}$, $Pt|Cl_2|Cl^{-}$, $Pt|O_2|OH^{-}$ -glass electrode) Electrochemical cells-concentration cells-Salt bridge – Liquid junction potential- emf measurement – Poggendorf's compensation method- digital method – electrochemical series – over voltage – theory – application in corrosion control –Polarography-storage cells – lead acid, Ni/Cd, – Fuel cells – H_2/O_2 fuel cells(Bacon cell), Hydrocarbon/air fuel cell-Bio-chemical fuel Cell . (5 Hours)

Acid- Bases – (Lowry-Bronsted and Lewis concepts – examples) – concept of pH – pH measurement – (instrumental details required) - Dissociation constants-Potentiometric titrations-(Neutralization, Oxidation-reduction, and Precipitation) Buffer solutions – Henderson's equation for calculation of pH (4 Hours)

Ref:

S.Glasstone (1997) "Textbook of Physical Chemistry" Macmillan, New Delhi, pp-1320
P.W.Atkins (1987) "Physical Chemistry" Oxford University Press, Oxford, pp-857
C.A.Hampel (Ed)(1964) "Encyclopedia of Electrochemistry", Reinhold Publishing Corporation, New York, pp-1206
A.Standen (Ed) (1964) "Kirk-Othmr Encylopaedia of Chemical Technology", Vol.3, John Wiley and Sons.Inc, New York, pp-925

SECTION-2

CHEMISTRY OF MATERIAL AND ENVIRONMENTAL DAMAGE

Module -4 (9 Hours)

Material damages and prevention: Corrosion – theoretical aspects -(electrochemical theory) – Galvanic series – Pourbiax diagram – assessment of corrosion potential of materials – Types of corrosion – Dry corrosion-direct chemical –Wet Corrosion-Electrochemical- differential aeration –Corrosion of Iron in acidic neutral, basic condition (Corrosion in boilers) – Galvanic corrosion-(corrosion at contact points in computers-Ag/Au)-Inter granular corrosion (18-8 Steel).Microbial corrosion - Factors influencing corrosion.

Corrosion protection-Self protecting corrosion products-Pilling-Bedworth rule-Coatings-Organic-(paints and polymers)-Inorganic Coatings-Galvanizing (dip coating, Sherardizing, Wire-gun

method)-Tinning- Electroplating-(Chromium, Nickel), Anodization of Aluminium- Passivation of metals by chemical treatment- Protection by Sacrificial Anode- Impressed current (4 Hours)

Environmental damages and prevention:

Pollution – Definitions – Classification of pollutants (Global, Regional, Local; Persistent and Non-persistent; Pollutants – Eg: CO_2, CO, SO_x, NO_x, VOC, SPM, CFC, POP, Dissolved metals) – effects on environments – Air pollution – Fossil fuel burning – Automobile exhausts – Photochemical smog – PAN, PBN formation-chemical equations required) – Stratospheric Ozone depletion- CFCs -Nomenclature CFC's –Chapman cycle of Ozone formation- CFC dissociation and its reaction with Ozone – Alternate refrigerants – Monitoring of pollution – gases (CO, SO_2,NO_X)and particulate (High volume sampler) -Pollution from thermal power plants – Coal composition- fly ash – Thermal pollution .

Methods of control of Air pollution – Bag filters, cyclones, Scrubbing, ESP, Catalytic converters - composition and action with CO, NO_x. Water pollution-Pollutant Classification-(Organic, Inorganic, Suspended and Dissolved- Toxic metal waste- BOD-COD-) monitoring (analytical methods-brief discussion) and control -Waste water treatment-Aerobic, Anaerobic-USAB process-Industrial waste water treatment.- Soil pollution-Solid waste-radio nuclides-Toxic metals-monitoring and control-Incineration-Dioxins- hazardous waste - deep-well injection (5 Hours)

Ref:L.L Shreir (Ed) " Corrosion Control" Vol. I and II Newnes-Butterworths, London

C.A.Hampel (Ed) "Encyclopedia of Electrochemistry" Reinhold Publishing corporation,pp-1206

V.Raghavan (2000) "Material Science and Engineering-A First Course" Prentice-Hall of India Pvt.Ltd , New Delhi, pp-485

A.K.De (1996),"Environmental Chemistry" New age International Pvt.Ltd, New Delhi, pp-364

C.N.Sawyer and P.L.McCarty,(1989)"Chemistry for Environmental Engineering" McGraw Hill Book Company, New-Delhi , pp-530

H.S.Peavy, D.R.Rowe and G.Tchobangoglous (1985) "Environmental Engineering" McGraw Hill International , pp-720

S.P.Mahajan (1985)" Pollution Control in Process Industries" Tata McGraw Hill, New Delhi, pp-273

S.E.Manahan (1975)"Environmental Chemistry" Willard Grant Press, Boston,pp-532.

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

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EN04-104A(P) : CHEMISTRY LAB(A)

(common for AI, EE, EC, IC, BM, BT)

1 hour lab per week or 2 hours lab per alternate weeks

List of Experiments

1.Estimation of purity of Copper(Iodometric method)

2.Estimation of purity of Aluminium (EDTA method)

3.Crystal growth (melt growth, Solution growth-$CuSO_4$,KDP,ADP crystals)

4..Phenol formaldehyde- preparationandstudy of properties

5.Urea formaldehyde- preparationandstudy of properties

6.Flash and fire point-Pensky –Martens apparatus

7.Measurement of Single Electrode potential – Poggendorf's method(M|M+ , M|MA|A-, Salt bridge preparation, Calculation of Junction potential)

8.Corrosion potential measurement of certain metals and alloys in 3.5% salt solution (Steel(18-8), Al, Cu, Brass, Bronze, Monel metal or any alloys of industrial use)-Potentiodynamic and Potentiostatic methods.

9.pH meter-Calibration and measurement of pH-Preparation of Buffers-Calculation of pH by Henderson's equation and verification.

10.Potentiometric titration of acid and base- plots of E / V, $\Delta E/\Delta V$, $\Delta^2 E/\Delta V^2$ plots.

11.Electrodepostion-plating of Copper-detection of the thickness of the layer deposited.

Anodizing of Aluminium –Characteristics of the coating

12.Estimation of SO_2, NO_2, H_2S.Calculation of concentration in ppm and microgram per M^3 and comparison of data with permitted levels.

13.Estimation of Pb, Cd in water - colourimetric method.

14.Estimation of Fluoride (Alizarin dye method), Nitrate in water –colourimetric method

15.Estimation of Dissolved oxygen (Winklers method)

16.Identification tests for certain common plastics (PE, PVC, Nylon, PET, etc.)

Preparation of some liquid crystals and study of their properties.

(Atleast 12 experiments should be done)

Internal work assessment

Lab practicals and record = 10+5

(Lab performance to be evaluated by the thoroughness of the procedure and practices, results of each experiment and punctuality in the submission of Rough and Fair Records)

Test/s = 10

Total marks = 25

EN04-105 : HUMANITIES

(common for all B. Tech. programmes)

2 hours lecture per week

Module I (10 hours)

Introduction to English usage and grammar-Review of grammar - affixes, prefixes, suffixes, participles and gerunds - transformation of sentences - commonly misspelt words - correction of mistakes - punctuation - idioms - style - vocabulary building

Reading comprehension -Exposure to a variety of reading materials, articles, essays, graphic representation, journalistic articles, etc.

Writing comprehension-Skills to express ideas in sentences, paragraphs and essays

Module II (10 hours)

Technical communication and report writing

Need, importance and characteristics of technical communication – correspondance on technical matters-aspects of technical description of machinery, equipment and processes - giving instructions in an industrial situation - note taking and note making - correspondence on technical topics - different types of technical reports

Module III (14 hours)

History of science and technology

Science and technology in the primitive society – the development of human civilization from primitive to modern society- impact of sciences and technology on societies – Cultural and industrial revolutions - the rise and development of early Indian science – contribution of Indian scientist-JC Bose, CV Raman, Visweswaraya-Ramanujam and Bhabha- Gandhian concepts-recent advances in Indian science

Module IV (10 hours)

Humanities in a technological age

Importance of humanities to technology, education and society - relation of career interests of engineers to humanities - relevance of a scientific temper - science, society and culture

Reference books

1. Huddleston R., *English Grammer - An outline* , Cambridge University Press
2. Pennyor, *Grammar Practice Activities* , Cambridge University Press
3. Murphy, *Intermediate English Grammar* , Cambridge University Press
4. Hashemi, *Intermediate English Grammar -Supplementary Exercises with answers* ", Cambridge University Press
5. Vesilind; *Engineering, Ethics and the Environment* , Cambridge University Press
6. Larson E; *History of Inventions* , Thompson Press India Ltd.
7. Bernal J.D., *Science in History* , Penguin Books Ltd
8. Dampier W.C., *History of Science* ", Cambridge University Press
9. Encyclopedia Britannica, *History of Science, History of Technology*
10. Subrayappa; *History of Science in India* , National Academy of Science, India
11. Brownoski J, *Science and Human Values* , Harper and Row

12. Schrodinger, *Nature and Greeks and Science and Humanism* , Cambridge University Press
13. Bossel, H, *Earth at a Crossroads - paths to a sustainable Future* , Cambridge University Press
14. McCarthy, *English V ocabulary in Use* , Cambridge University Press
15. Anna University, English for Engineers and Technologists, Orient Longman
16. Meenakshi Raman et al., Technical communication –Principles and practice, Oxford University Press

Internal work assessment

One essay on relevant topic	10
One technical report	10
2 test	2X15= 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN04- 106A : ENGINEERING GRAPHICS(A)

(common for AI, CS, EE, EC, IT, IC, PT, BM,PT)

1 hour lecture and 3 hours drawing

Module - 0 (8 Hours - 1 Drawing exercise)
Drawing instruments and their use - different types of lines - lettering and dimensioning - familiarization with current Indian Standard Code of practice for general engineering drawing. Construction of ellipse, parabola and hyperbola. Construction of cycloid, involute and helix. Introduction to Computer Aided Drafting. (For practice only, not for University Examination)

Module - 1 (12 Hours - 3 drawing exercises)
a) Introduction to orthographic projections - vertical, horizontal and profile planes - principles of first angle and third angle projections. Projections of points in different quadrants. Orthographic projections of straight lines parallel to one plane and inclined to the other plane - straight lines inclined to both the planes and occupied in one quadrant- traces of lines.
b) True length and inclination of a line with reference planes. Line occupied in more than one quadrant. Line inclined to the two reference planes but parallel to the profile plane. line dimensioned in surveyor's unit.

Module - II (16 Hours - 3 drawing exercises)
a) Projections of plane laminae of geometrical shapes parallel to one plane and inclined to the other plane - plane laminae inclined to both the planes. Auxiliary projections of plane laminae. Projections of laminae inclined to the two reference planes but perpenticular to the profile plane.
b) Projections of polyhedra and solids of revolution - frustums - projections of solids with axis parallel to one plane and inclined to the other plane. Projections of solids with the axis inclined to both the planes.(Solids to be drawn : Cube, prisms, pyramids, tetrahedron, cone, and cylinder.)Projections of solids on auxiliary planes. Projections of combinations of solids. (Solids to be drawn : Prisms, pyramids, tetrahedron, cube, cone, and sphere)

Module - III (12 Hours - 3 drawing exercises)
a) Sections of solids - sections by planes parallel to the horizontal or vertical planes and by planes inclined to the horizontal or vertical planes. True shape of section by projecting on auxiliary plane, (Solids to be drawn : Cube, prisms, pyramids, tetrahedron, cone, and cylinder.)

b) Development of surfaces of solids - method of parallel line, radial line, triangulation and approximate developments. Development of polyhedra, cylinder, cone, and sectioned solids. Development of solids having hole or cut.

Module - IV (12 Hours - 3 drawing exercises)
a) Introduction to isometric projection - isometric scale - isometric views - isometric projections of prisms, pyramids, cylinder, cone, spheres, sectioned solids and combinations of them. Principle of oblique projection - cavalier, cabinet and general oblique projections of solids and simple objects.
b) Introduction to perspective projections - Classification of perspective views - parallel, angular and oblique perspectives - visual ray method and vanishing point method of drawing perspective projection- perspective views of prisms, pyramids and circles.

Module - V(12 Hours - 6 drawing exercises)
a) Introduction to multiview projection of objects - the principle of the six orthographic views - convertion of pictorial views of simple engineering objects into orthographic views.
b) Conventional representation of threaded fasteners. Drawing of nuts, bolts, washers and screws . Locking arrangements of nuts. Bolted and Screwed joints. Foundation bolts of eye end type, hook end type and split end type.

NOTE: *All drawing exercises mentioned above are for class work. Additional exercises where ever necessary may be given as home assignments.*

Text books

1. John K.C., *Engineering Graphics* , Jet Publications
2. P.I. Varghese, Engineering Graphics, VIP Publications
3. Bhatt N.D., *Elementary Engineering Drawing* , Charotar Publishing House

Reference books

4. Luzadder W.J., *Fundamentals of Engineering Drawing* , Prentice Hall of India
5. Narayana K.L and Kannaiah P, *Engineering Gr aphics* , Tata McGraw Hill
6. Gill P.S., *Geometrical Drawing* , Kataria and sons

Internal work assessment

Drawing exercises (Best 10)	10x3	= 30
2 tests	2x10	= 20
Total marks		= 50

University examination pattern

No question from module 0
Q I - 2 questions A and B of 20 marks from module I with choice to answer any one
Q II - 2 questions A and B of 20 marks from module II with choice to answer any one
Q III - 2 questions A and B of 20 marks from module III with choice to answer any one
Q IV - 2 questions A and B of 20 marks from module IV with choice to answer any one
Q V - 2 questions A and B of 20 marks from module V with choice to answer any one

EN04- 107A : ENGINEERING MECHANICS(A)

(Common for AI, CH, CS, EE, EC, IT, IC, BM, BT, PT)

2 hours lecture and 1 hour tutorial per week

Objectives

1. To acquaint the student with general methods of analyzing engineering problems
2. To illustrate the application of the methods to solve practical engineering problems

Module I (17 hours)

Principles of statics – Free body diagrams – Coplanar forces and Force systems – Resultant and equilibrium conditions for concurrent, parallel and general system of forces – Solution of problems by scalar approach.

Introduction to vector approach (Application to simple problems only) – Concurrent forces in space – Resultant – Equilibrium of a particle in space – Non-concurrent forces in space - Resultant of force systems.

Module II (17 hours)

Friction – Laws of friction – Simple contact friction problems – Wedge – Screw jack and its efficiency.

Properties of surfaces – First moment and centroid of curve and area – Centroid of composite plane figures – Theorems of Pappus-guldinus- Second moments of plane figures and composite sections – Transfer theorems – Polar moment of area – Product of area and Principal axes (conceptual level treatment only).
Moment of inertia of a rigid body – M.I of a lamina – M.I of 3 dimensional bodies (cylinder, circular rod, sphere).

Module III (17 hours)

Introduction to structural mechanics – Different types of supports, loads and beams – Reactions at supports.Shear force and Bending moment in beams – Shear force and bending moment diagrams for cantilever and simply supported beams (only for concentrated and uniformly distributed load cases).

Plane trusses – Types of trusses (Perfect, Deficient and Redundant trusses) – Analysis of trusses - Method of joints - Method of sections.

Module IV (15 hours)

Kinetics of rectilinear motion – Newton's second law– D'Alembert's principle – Motion on horizontal and inclined surfaces – Analysis of lift motion - Motion of connected bodies.

Curvilinear motion – Equation of motion – Tangential and normal acceleration - Centripetal and centrifugal forces – Motion of vehicles on circular path.

Work, Power and Energy – Work done by a force – Work of the force of gravity and force of spring - Work-energy equation – Transformation and conservation of energy – Applications to problems.

Kinematics of rotation – Rigid body rotation about a fixed axis – Rotation under the action of constant moment.

Introduction to mechanical vibrations - Simple harmonic motion – free vibration – Oscillation of spring - Torsional vibration

Text Books

1. Timoshenko and Young, "Engineering Mechanics", McGraw Hill Publishers
2. Hibbeler, Engineering Mechanics, Vol.I statics, Vol II Dynamics, Pearson
3. Shames, I.H., "Engineering Mechanics- Statics and Dynamics", Prentice Hall of India

Reference Books

1. Beer,F.P. and Johnson, E.R., "Mechanics for Engineers- Statics and Dynamics", McGraw Hill Publishers.
2. Rajasekharan and Sankarasubramanian, "Engineering Mechanics", Vikas Publishing House

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher. (At least one assignment should be computer based using spread sheet or suitable tools)
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module (in which, at least 5 questions to be numerical)
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one
(QII to V can have subdivisions and **at least 80% weightage** for numerical problems)

EE04- 108 MECHANICAL ENGINEERING I

2 hours lecture per week

Module 1 (Hours 12)

Basic concepts- Terms and definition, system and control, volume - Continuum concept - Microscopic and Macroscopic approaches. State, properties, processes, cycles. Thermodynamic Equilibrium Equation of state.. Zeroth law of Thermodynamics. Temperature concept, Temperature scales.
First Law of Thermodynamics- Joules Experiment, Internal energy, enthalpy. First law applied to closed and open systems. Steady and unsteady flow processes. Simple numerical problems.

Module II (Hours 10)

Second law of thermodynamics, Kelvin Planck's and Clausius statements, heat engine, heat pump and refrigerator, efficiency and COP, Carnot cycle, Carnot's engine, Entropy and availability, principles of entropy increase-physical interpretation of entropy, I C engines- classification, Types , Working principles of 2 stroke & 4 stroke engine, S I and C I engines.

Module III (Hours 10)

Air Power , Vapour power and Refrigeration cycles- Otto cycles, Diesel cycle, expression for efficiency, simple Brayton cycle, expressions for efficiency. Properties of steam - use of steam tables & Mollier diagram, Rankine cycle, expression for efficiency. Refrigeration cycles, vapour compression refrigeration cycle- simple numerical problems.

Module IV (Hours 12)

Power plant engineering- lay out of steam, gas turbine , diesel, hydel , nuclear power plants, various components and their functions, nuclear power plant safety and nuclear waste disposal systems.

Alternative sources of energy solar, geothermal, wind, tidal OTEC and Biomass energy utilization (detailed study not expected)

Text Books

1. Thermodynamics & Heat engines- R Yadhav-Central Publishing House
2. Thermodynamics- P K Nag, Tata Mcgraw hill
3. Power Plant Engineering- Nagpal, Khanna Publishers
4. Power Plant Engineering- Dom Kundwar, Dhanpat Rai Sons Ltd

Reference

1. Introduction to Thermodynamics-Van Wyn and Richard Sonntag-New Age International
2. Power Plant Technology- E L Wakil -Mcgraaw Hill

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University Examination Pattern

QI – 8 short questions of 5 marks, 2 from each module
QII – 2 questions A and B of 15 marks from module I with choice to answer any one and Each full question can have two parts with one part from theory and the other a problem
QIII – 2 questions A and B of 15 marks from module I with choice to answer any one and Each full question can have two parts with one part from theory and the other a problem
QIV – 2 questions A and B of 15 marks from module I with choice to answer any one and Each full question can have two parts with one part from theory and the other a problem
QV – 2 questions A and B of 15 marks from module I with choice to answer any one and Each full question can have two parts with one part from theory and the other a problem

EE04-109 BASIC ELECTRICAL ENGINEERING

(Common for EE,EC, AI, IC, BM, BT, PT)

2 hours lecture per week

Module 1 (10 hours)

Elementary concept and definitions of current, voltage, power and energy – Introductory circuit analysis - Independent voltage and current sources- Dependent voltage and current sources - Source transformation - Ohm's law – Kirchoff's laws –Solutions of simple series, parallel and series-parallel circuits with DC excitation – Solutions of resistive circuits with dependent sources – Mesh analysis and Nodal analysis – Nodal conductance matrix and mesh resistance matrix.

Basic network theorems – Linearity – Concept of a linear element – Concept of a linear circuit – Passive vs. active elements – Bilateral & unilateral elements – Thevenin's theorem – Norton's theorem – Superposition theorem – Substitution theorem – Maximum power transfer theorem.

Module II (12 hours)

Magnetic circuits – MMF – Magnetic flux – Reluctance – Comparison of magnetic and electric circuits – Magnitisation curves of ferromagnetic materials – Solution of magnetic circuits.

Faraday's laws of electromagnetic induction - Lenz's law - Dynamically and statically induced emfs - Self and mutual inductances - Inductances in series and parallel – Mutual flux and leakage flux - Coefficient of coupling - Dot convention- Cumulative and differential connection of coupled coils.

Electostatics - Capacitance- Parallel plate capacitor - Capacitors in series and parallel – Charging and discharging of capacitor - Energy stored in electrostatic fields – potential gradient – Dielectric strength.

Two terminal element relationships – V-I relationship for inductance and capacitance.

Time domain analysis of circuits - Linier differential equations for series RL and RC, parallel RL and RC, series RLC and parallel RLC circuits - Complete solution for step/dc, voltage/current inputs – Natural response – Transient response - Time constant - Rise and fall times – Determination of initial conditions.

Module III. (12 hours)

Single phase AC circuits: Alternating quantities - Generation sinusoidal emf.- Mathematical equations - Definitions and explanations of the terms: wave form, cycle, time period, frequency, amplitude, phase, phase difference, rms value, average value, form factor and peak factor - Calculations for square, triangle, trapezoidal and sinusoidal waveforms.

Phasor representation of sinusoidal qualities - Phase difference - Addition and subtraction of sinusoids –Symbolic representation - Cartesian, polar and exponential forms.

Analysis of ac circuits: R, L, C, RL, RC and RLC circuits using phasor concept -Concept of impedance, admittance, conductance and susceptance – Power in single phase circuits – Instantaneous power - Average power - Active and reactive powers - Apparent power - Power factor - Complex power – Solutions of series, parallel and series-parallel AC circuits. - Series and parallel resonances – Q-factor - Frequency response curves - Half power frequencies – Bandwidth – Application of Thevenin's and Norton's theorems for AC circuits.

Module IV (10 hours)

Analysis of polyphase circuits – 2 phase circuits – Three phase AC circuits – Generation of 3 phase AC voltages – Balanced system – Phase sequence – Star-delta transformation – Balanced 3 phase AC source supplying balanced 3 phase star connected and delta connected loads – 3 wire and 4 wire systems - Neutral current – Active power, reactive power, apparent power, and power factor – Power factor improvement – Unbalanced systems – Neutral shift (explanation and concept only) – Three phase power measurement – Three wattmeter and Two wattmeter methods.

Text Books

Hughes E. *Electrical technology* , Pearson Education.
D.P. Kothari & Nagarth – *Theory and problems of Basic Electrical Engineering* – Prentice Hall (India) PVT LTD.

Reference

Edminister J A. *Electric circuits* , Schaum's series. McGraw Hill
Van valkenberg, *Electric circuits and network analysis* , Prentice Hall (India) PVT LTD.
Smarjith Ghosh – *Fundamentals of Electrical and Electronics Engineering* Prentice Hall (India) PVT LTD.

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q1 – 8 short type questions of 5 marks 2 from each module.
QII – 2 questions A and B of 15 marks from module I with choice to answer any one

QIII – 2 questions A and B of 15 marks from module II with choice to answer any one
QIV – 2 questions A and B of 15 marks from module III with choice to answer any one
Q V – 2 questions A and B of 15 marks from module IV with choice to answer any one

EE04-110(P) : CIVIL AND MECHANICAL WORKSHOP

(common for EE, CS, IT, PT)

3 hours practicals per we ek (Part A and Part B in alternate week)

Part A: Civil engineering workshop(33 hours)

1. Chain surveying - study of instruments and chain survey traverse
2. Compass surveying - study of instruments and compass traverse
3. Plane table surveying - study of instruments and plane tabling by intersection and radiation methods
4. Plane table surveying - plane table traverse
5. Levelling - study of instruments, temporary adjustments of dumpy level
6. Fly levelling
7. Theodolite surveying - study of instruments, temporary adjustments,
8. Theodolite surveying - measurement of horizontal angles by reiteration method and repetition method
9. Study of electronic distance/ level measuring equipment (or total station)

Internal work assessment

Surveying practicals and record	= 15
Test	= 10
Total marks	= 25

Part B: Mechanical engineering workshop (33 hours)

Machine shop practice (9 hours)
Study of different machine tools - lathe, shaper, milling machine, drilling machine grinding machine - exercises on lathe - models involving straight turning, taper turning, facing knurling, and thread machining

Fitting practice (6 hours)
Study of hand tools and measuring tools used in fitting work - fabrication exercises involving cutting, chiseling, filing and drilling - use of thread dies and taps

Welding practice (6 hours)
Study of electric arc welding and gas welding equipments - accessories and tools - safety practices - exercises involving preparation of different types of welded joints - lap and butt joints - gas cutting equipment and demonstration

Sheet metal practice (6 hours)
Study of shearing bending and folding machines, press brake etc. used in sheet metal work - hand tools in sheet metal work - development and fabrication of simple sheet metal components like

cylindrical dish, funnel, rectangular duct, tray, panel board etc. - soldering and brazing of joints - die cutting operations

Carpentry practice (6 hours)

Wood and its processing - shop equipment - measuring and marking tools - wood working hand tools - wood working machinery - preparation of joints - lap, butt, dovetail, mortise and tenon and bridle joints - wood turning

Internal work assessment

Workshop practicals and record	= 15
Test	= 10
Total marks	= 25

EE04- 111(P) : ELECTRICAL AND ELECTRONICS WORKSHOP

(Common for EE,EC, AI, IC,BT, BM, CS, IT, PT)

2 hours practicals per week

Part A: Electrical Workshop (2 hours per alternate weeks)

1. Familiarisation of various types of Service mains - Wiring installations - Accessories and house-hold electrical appliances
2. Methods of earthing - Measurement of earth resistance - Testing of electrical installations - Precautions against and cure from electric shock
3. Practice of making Britannia joints on copper / aluminium bare conductors
4. Practice of making Married joints on copper / aluminium conductors
5. Practice of making T joints on copper / aluminium conductors
6. Wiring practice of a circuit to control 2 lamps by 2 SPST switches
7. Wiring practice of a circuit to control 1 lamp by 2 SPDT switches
8. Wiring practice of a circuit to control 1 fluorescent lamp and 1 three-pin plug socket
9. Wiring practice of a main switch board consisting of ICDP switch, DB, MCB's, and ELCB's
10. Familiarisation of various parts and assembling of electrical motors and Wiring practice of connecting a 3-phase / 1-phase motor with starter

Internal work assessment

Workshop practicals and record	= 15
Test/s	= 10
Total marks	= 25

Part B – Electronics Workshop (2 hours per alternate weeks)

Familiarisation of various electronics components such as resistors, AF&RF chokes, capacitors, transistors, diodes, IC's and transformers

1. Assembling and soldering practice of single phase full wave bridge rectifiers circuit with capacitor filter
2. Assembling and soldering practice of common emitter amplifier circuit
3. Assembling and soldering practice of common emitter amplifier circuit on PCB
4. Assembling and soldering practice of non inverter amplifier circuit using OPAMP on PCB

5. Assembling of a timer circuit IC555, phase shift oscillator circuit using OPAMP and JK flip-flop using NAND gates on a bread-board
6. Coil winding - Single layer and multi layer - Demonstration
7. Miniature transformer winding - Demonstration
8. PCB layout using software like ORCARD, CIRCUITMAKER, EDWIN
9. PCB fabrication - Demonstration

Internal work assessment	
Workshop practicals and record	= 15
Test/s	= 10
Total marks	= 25