

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY  
LUCKNOW**



**Evaluation Scheme & Syllabus**

**for**

**B.Tech. First Year**

**(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)**

**On**

**Choice Based Credit System**

**(Effective from the Session: 2016-17)**

# DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

## B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physics-I	3---0---0	70	20	10	100	3
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 204/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0--0--2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0--0--2	50		50	100	1
8	RAS 254/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0--0--2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0--0--3	50		50	100	2
10	RGP101	General Proficiency				100	100	0
	<b>TOTAL</b>						<b>1000</b>	<b>23</b>

# DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

## B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physics-II	3---0---0	70	20	10	100	3
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS101/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS151/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
10	RGP201	General Proficiency				100	100	0
	<b>TOTAL</b>						<b>1000</b>	<b>23</b>

## Engineering Mathematics - I

L	T	P
3	1	0

### Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit, Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

### Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

### Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

### Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

### Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

#### Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

#### Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
  2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas ( Cengage) Learning.
  3. Thomas & Finley, Calculus, Narosa Publishing House
  4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.
- A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

## RAS101

### ENGINEERING PHYSICS-I

#### **Unit – I: Relativistic Mechanics**

**08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

#### **Unit – II: Modern Physics**

**10 Hrs.**

Black body radiation spectrum, , Weins law and Rayleigh-Jeans law ,Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation ( Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

#### **Unit – III: Wave Optics**

**10 Hrs.**

**Interference:** Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

**Diffraction:** Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

#### **Unit – IV: Polarization and Laser**

**08 Hrs.**

**Polarization:** Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate. Optical Activity, Fresnel's theory, Specific rotation.

**Laser:** Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

#### **Unit – V: Fiber Optics and Holography**

**06 Hrs.**

**Fiber Optics:** Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers. Dispersion and Attenuation.

**Holography:** Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

#### **Reference Books:**

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optical Fibre & Laser - Anuradha De ( New Age )
4. Optics –Ajoy Ghatak ( Tata McGraw Hill Education Private Ltd. New Delhi)

5. Optics - Brijlal & Subramanian (S. Chand )
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

**RAS-151/RAS-251**

**ENGINEERING PHYSICS LAB**

L T P  
0 0 2

List of Experiments

Any ten experiments, at least four from each group.

**Group -A**

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

**Group – B**

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
- 14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	8
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradable polymers. Preparations and applications of some industrially important polymers (Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6, Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	8
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	8
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	8
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and $H^1NMR$ spectral Techniques.	8

**Textbook**

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

**Reference Books**

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education

9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

**RAS 152/ RAS 252**

## **ENGINEERING CHEMISTRY PRACTICALS**

### **LIST OF EXPERIMENTS**

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per



**REC101 / REC201**

**ELECTRONICS ENGINEERING**

Unit	Topics	Lectures
I	PN junction diode: <b>Introduction of Semiconductor Materials</b> Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices :Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor:  Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier ( $r_e$ Model ). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). <b>OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current</b> Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, <b>Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.</b>	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, <b>Introduction of various analog modulation techniques</b> , Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

**Text Books:**

1. Robert L. Boylestand / Louis Nashelsky “*Electronic Devices and Circuit Theory*”, 10th Edition, Pearson Education.
2. H S Kalsi, “*Electronic Instrumentation*”, 3rd Edition, TMH Publication, 2012.
3. George Kennedy, “*Electronic Communication Systems*”, 5<sup>th</sup> Ed, TMH, 2012.

**Reference Books:**

1. David A. Bell, “*Electronic Devices and Circuits*”, 5<sup>th</sup> Ed, Oxford University Press, 2008
2. Jacob Millman, C.C. Halkias, Staya brataJit, “*Electronic Devices and Circuits*”, 3<sup>rd</sup> Edition, TMH, 2008 .
3. **David A. Bell, *Electronic Instrumentation and Measurements*, 3<sup>rd</sup> Ed, Oxford University Press India; Third edition, 2013.**

**PROPOSED SYLLABUS WITH JUSTIFICATION****BRANCH : ELECTRONICS AND COMMUNICATION****BRANCH CODE : 031****SUBJECT NAME : ELECTRONICS ENGINEERING****SUBJECT CODE : NEC-101/ NEC-201**

<b>UNIT I: PN JUNCTION DIODE</b>			
<b>TOPIC NAME</b>		<b>No. of Lectures required</b>	<b>Remarks</b>
1.	<b>Introduction of Semiconductor Materials</b>	1	<b>ADDED:</b> Basic knowledge of semiconductor materials is necessary to start the subject.
2.	Depletion layer, V- I Characteristics, Ideal and practical, practical, Diode resistance, Diode capacitances	1	

3.	Diode equivalent circuits, Transition and diffusion capacitance, Diodes break-down mechanisms (Zener and Avalanche)	1	
4.	Diode Applications: Series, parallel and combination of series, Parallel diode configuration	1	
5.	Half and Full-Wave Rectification	1	
6.	Clippers	1	
7.	Clampers	2	
8.	Zener diode as shunt regulator	2	
9.	Voltage Multiplier Circuits	1	
10.	Special purpose two terminal devices: Light emitting diodes, varactor Diode, Tunnel diodes, Liquid crystal displays	1	

**UNIT 2: BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTOR**

TOPIC NAME		No. of Lectures required	Remarks
1.	Transistor construction, Operation, Amplification action ,	1	
2.	Common base, Common Emitter, Common Collector configurations	1	
3.	DC Biasing BJTs: Operating point, Fixed Bias, Emitter Bias, Voltage-divider bias, Collector Feedback, Emitter Follower configuration.	3	
4.	Bias Stabilization. CE,CB,CC amplifiers and AC analysis of single stage CE amplifier ( $r_e$ Model ).	2	
5.	JFET :Construction and Characteristics of JFETs,	1	
6.	CS, CD, CG Amplifier, AC analysis of CS amplifier,	1	
7.	MOSFET :The Depletion –Mode MOSFET Drain and Transfer characteristics, The Enhancement-Mode MOSFET Drain and Transfer characteristics	1	

<b>UNIT 3: OPERATIONAL AMPLIFIERS</b>			
<b>TOPIC NAME</b>		<b>No. of Lectures required</b>	<b>Remarks</b>
1.	Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits,	2	
2.	Practical op amp circuits (Inverting Amplifier and non-inverting Amplifier, Unity gain amplifier, Summing amplifier, Integrator, Differentiator)	2	
3.	<b>OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current</b>	1	<b>ADDED:</b> In order to understand the OPAMP all the OPAMP Parameters must be known to students.
4.	Differential and common mode operation	1	
<b>UNIT 4: ELECTRONIC INSTRUMENTATION AND MEASUREMENTS</b>			
<b>TOPIC NAME</b>		<b>No. of Lectures required</b>	<b>Remarks</b>
1.	Digital Voltmeters, Introduction, Ramp Techniques	1	
2.	Digital Multimeters	1	
3.	Block Diagram of Cathode Ray Oscilloscope, Principle of operation	1	
4.	Cathode-Ray tube: Introduction, Basic Principle, CRT	1	
5.	Measurement of Voltage, Frequency, and Phase using CRO	1	
6.	<b>Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope</b>	1	<b>ADDED:</b> Student to have knowledge of DSO as it is most commonly used in laboratories and Industries.
<b>UNIT 5: FUNDAMENTALS OF COMMUNICATION ENGINEERING</b>			

<b>TOPIC NAME</b>		<b>No. of Lectures required</b>	<b>Remarks</b>
1.	Elements (Terminology) of a Communication System	1	
2.	Need of Modulation , Electromagnetic spectrum and typical applications.	1	
3.	Basics of Signal Representation and Analysis	1	
4.	<b>Introduction of various analog modulation techniques</b>	1	<b>ADDED:</b> Basic knowledge of Amplitude and Angle modulation is essential for students of all Branches,
5.	Fundamentals of amplitude modulation	1	
6.	<b>Fundamentals of Angle modulation</b>	-	<b>REMOVED:</b> Basics of this topic is already covered in S.No. 31. Further details are not required for 1st year students.
7.	Modulation and Demodulation Techniques of AM	1	

**UNIT –I**

**Engineering Materials:** Engineering Materials: Types and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer

**Manufacturing Processes:** Molding and casting, forging, rolling, welding- arc welding-gas welding, sheet metal forming (fundamentals and simple descriptions only)

**Machine Tools:** Simple description of general purpose machines like lathe, shaping machines, drilling machines, grinding machines and milling machines, Basic concepts of CNC, DNC, CIM and CAD/CAM

**UNIT –II**

**Laws of Thermodynamics:** First Law of Thermodynamics, Second Law of Thermodynamics, Clausius statement and Kelvin-Planck statement Equivalence of Kelvin-Planck statement and Clausius statement Perpetual Motion Machine I & II Concept of Reversibility & reversible cycle. Entropy as a property, Clausius inequality, principle of increase of Entropy

**Heat Engines:** Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles

**UNIT -III**

**IC ENGINES:** Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, and specific fuel consumption, [numerical on IC Engines]

**Steam Formation and Properties:** Classification of boilers, Lancashire boiler, Babcock and Wilcox boiler, boiler mountings and accessories, wet steam, saturated and superheated steam, specific volume, enthalpy and internal energy use of Steam tables, Rankine cycle.

**UNIT -IV**

**Introduction:** Introduction to Engineering mechanics and its classification. Laws of mechanics. Physical quantities –units and dimensions

**Force System:** Force, Classification & Representation, Force as a Vector, Parallelogram Law, Lami's theorem, Method of Resolution and Principle of Transmissibility of forces. Moment of a force, Couple, Vector representation, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

**Friction :**Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction– Contact friction problems – ladder friction, Wedge friction – Screw friction.

## UNIT- V

**Structural Analysis:** Plane Truss, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members

**Center of Gravity and Centroid:** Determination of centroid by integration, Centroid of composite bodies.

**Moment of Inertia:** Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas.

**Mass Moment of Inertia:** Moment of Inertia of masses, Mass moment of inertia of simple bodies by integration.

### Reference Books:

1. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
2. Thermodynamics: An Engineering Approach, Yunus A. Cengel (Author), Michael A. Boles (Author).
3. Engineering Thermodynamics by P.K.Nag, Tata Mc Graw Hill Pub.
4. Thermal Engineering By R.K. Rajput, Laxmi Publication.
5. Engineering Thermodynamics by C.P. Arora.
6. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa New age International
7. Textbook of Engineering Mechanics by R. S. Khurmi Southgate Publishers
8. Engineering Mechanics by R K Bansal Laxmi Publications
9. Production Technology By Hmt, Hmt, H M T Bangalor
10. Elements of Workshop Technology by Hajra Choudhary Media Promotor
11. Engineering Mechanics, Vela Murali, Oxford publications.

**RME151/RME251**

**ELEMENTS OF MECHANICAL ENGINEERING LAB**

**LTP 0-0-2**

**Note: Minimum of 5 experiments to be conducted from each module**

**Module 1:**

1. To study about various types of Mounting and Accessories of Boilers
2. To study about Babcock and Wilcox boiler and Cochran boiler.
3. To study about 2 stroke diesel and petrol engine
4. To study about 4 stroke diesel and petrol engine
5. To study the vapour compression Refrigeration System and determination of its C.O.P
6. To study the functioning of Window Room Air Conditioner.

**Module 2:**

7. To study the equilibrium of a body under three forces and verify the same with parallelogram law of force.
8. To study the equilibrium of a body subjected to more than three numbers of forces and verify the same with polygon law of force.
9. To determine the coefficient of friction of a flat inclined surface.
10. Friction experiment on screw-jack.
11. Worm & worm-wheel experiment for lifting loads
12. To find the percentage error between observed and calculated values of force in the members of a truss.



**COURSE OUTCOMES**

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

**DETAILED SYLLABUS**

**Unit-I : Electrical Circuit Analysis:**

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

**Unit-II: Steady- State Analysis of Single Phase AC Circuits:**

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

**Network theorems (AC & DC with independent sources):** Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

**Unit-III : Three Phase AC Circuits:**

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

**Measuring Instruments:** Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

**Unit-IV: Magnetic Circuit:** Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

**Single Phase Transformer:** Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

**Unit-V: Electrical Machines:**

**DC machines:** Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

**Three Phase Induction Motor:** Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

**Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications.

**Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.

**Text Books:**

1. "Basic Electrical Engineering", S N Singh; Prentice Hall International
2. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers
3. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
4. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
5. "Electrical Engineering", J. B. Gupta, Kataria and Sons

**Reference Books:**

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar, M.S. Shukhija; Oxford University Press

**COURSE OUTCOMES**

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

**LIST OF EXPERIMENTS**

**Note: A minimum of ten experiments from the following should be performed**

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verification of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

Unit1 (10 Lectures)

Basics of Computer:

Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers. Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system :

Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming:

Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution:

Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

## Computer Programming Lab

- 1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
- 2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
- 3.WAP to calculate the area and circumference of a circle.
- 4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula  $C/5=(F-32)/9$ .
- 5.WAP that swaps values of two variables using a third variable.
- 6.WAP that checks whether the two numbers entered by the user are equal or not.
- 7.WAP to find the greatest of three numbers.
- 8.WAP that finds whether a given number is even or odd.
- 9.WAP that tells whether a given year is a leap year or not.
- 10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:  
Between 90-100%-----Print 'A'  
80-90%-----Print 'B'  
60-80%-----Print 'C'  
Below 60%-----Print 'D'
- 11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
- 12.WAP to print the sum of all numbers up to a given number.
- 13.WAP to find the factorial of a given number.
- 14.WAP to print sum of even and odd numbers from 1 to N numbers.
- 15.WAP to print the Fibonacci series.
- 16.WAP to check whether the entered number is prime or not.
- 17.WAP to find the sum of digits of the entered number.
- 18.WAP to find the reverse of a number.
- 19.WAP to print Armstrong numbers from 1 to 100.
- 20.WAP to convert binary number into decimal number and vice versa.
- 21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
- 22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
- 23.WAP to find the minimum and maximum element of the array.
- 24.WAP to search an element in a array using Linear Search.
- 25.WAP to sort the elements of the array in ascending order using Bubble Sort technique.
- 26.WAP to add and multiply two matrices of order nxn.
- 27.WAP that finds the sum of diagonal elements of a mxn matrix.
- 28.WAP to implement strlen (), strcat (), strcpy () using the concept of Functions.
- 23
- 29.Define a structure data type TRAIN\_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start

station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train

timetable and implement the following operations:

- (i) List all the trains (sorted according to train number) that depart from a particular section.
- (ii) List all the trains that depart from a particular station at a particular time.
- (iii) List all the trains that depart from a particular station within the next one hour of a given time.
- (iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

## Professional Communication

S.No.	Unit	Contents
1	<b>Unit-1 Fundamentals of Communications</b>	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	<b>Unit-II Written Communication</b>	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	<b>Unit-III Business Communication</b>	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	<b>Unit-IV Presentation Strategies and Soft Skills.</b>	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	<b>Unit –V Value- Based Text Readings</b>	Following essays from the prescribed text book with emphasis on Mechanics of writing. (i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior (ii) The Language of Literature and Science by A. Huxley (iii) Man and Nature by J. Bronowski (iv) Science and Survival by Barry Commoner (v) The Mother of the Sciences by A.J. Bahm.
6	<b>Text Book</b>	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	<b>Reference Books</b>	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co.

		<p>Ltd. , 2001, New Delhi.</p> <ol style="list-style-type: none"><li>3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. &amp; Distributors, 2009, Delhi.</li><li>4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.</li><li>5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.</li><li>6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.</li><li>7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal &amp; J.B. Harrison Orient Blackswan, 2013, New Delhi.</li></ol>
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**RAS154/RAS254**

**PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS**

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

**LIST OF PRACTICALS**

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Presentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

**Reference Books**

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

**1. Carpentry Shop:**

1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

**2. Fitting (Bench Working) Shop:**

1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

**3. Black Smithy Shop:**

1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

**4. Welding Shop:**

1. Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

**5. Sheet-metal Shop:**

1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

**6. Machine Shop:**

1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

**7. Foundry Shop:**

1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

**Introduction**

Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes

2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

1 – Sheet Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres.

1-Sheet

**Text Books**

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

**Reference Books**

1. Engineering Graphics - K.R. Gopalakrishna, 32<sup>nd</sup> edition, 2005- Subash Publishers Bangalore.
  2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
- Engineering Drawing – M.B. Shah, B.C.Rana, 2<sup>nd</sup> Edition, 2

## Engineering Mathematics - II

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>1</b>	<b>0</b>

### Unit - 1: Ordinary Differential Equations

Linear differential equations of  $n^{\text{th}}$  order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

### Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

### Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

### Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena. Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

### Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

#### Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

#### Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

## **RAS-201**

### **ENGINEERING PHYSICS- II**

#### **Unit – I: Crystal Structures and X-ray Diffraction 10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

#### **Unit – II: Dielectric and Magnetic Properties of Materials 10Hrs.**

**Dielectric Properties:** Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

**Magnetic Properties:** Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

#### **Unit – III: Electromagnetic Theory 06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

#### **Unit – IV: Band Theory of Solids 06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

#### **Unit – V: Physics of some technologically important Materials 08Hrs.**

**Superconductors:** Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

**Nano-Materials:** Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

#### **Reference books:**

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)

2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)