

# Curriculum and Syllabus for B.Tech., I Year



(From 2017-2018 Batch Onwards)

**National Institute of Technology Puducherry  
Karaikal – 609 609**

## SEMESTER- I

<b>CODE</b>	<b>COURSE OF STUDY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
HM101	Functional English	2	0	2	3
MA101	Differential Calculus and Algebra	3	0	0	3
EE101/ CE101	Basics of Electrical and Electronics Engineering / Engineering Mechanics	3	0	0	3
PH101/CH101	Engineering Physics / Chemistry	3	0	0	3
CE102/ME101	Basic Energy, Environment, and Agricultural Engineering / Basic Mechanical and Civil Engineering	2	0	0	2
PH102/CH102	Engineering Physics Laboratory / Chemistry Laboratory	0	0	3	2
ME102/ ME103	Engineering Graphics / Workshop Practice	0	0	3	2
Compulsory	NSS/NSO/NCC (C)	0	0	0	0
<b>Total Credits</b>		<b>13</b>	<b>0</b>	<b>8</b>	<b>18</b>

## SEMESTER- II

CODE	COURSE OF STUDY	L	T	P	C
HM102	Technical English	1	0	2	2
MA102	Integral Calculus and Solution of Ordinary Differential Equations	3	0	0	3
CE101/ EE101	Engineering Mechanics / Basics of Electrical and Electronics Engineering	3	0	0	3
CH101/PH101	Engineering Physics / Chemistry	3	0	0	3
CS101	Basics of Programming*	1	0	2	2
HM103	Basics of Human Life Sciences	2	0	2	2
ME101/CE102	Basic Mechanical and Civil Engineering / Basic Energy, Environment, and Agricultural Engineering	2	0	0	2
CH102/PH102	Chemistry Laboratory / Engineering Physics Laboratory	0	0	3	2
ME103/ ME102	Workshop Practice / Engineering Graphics	0	0	3	2
Compulsory	NSS/NSO/NCC (C)	0	0	0	0
<b>Total Credits</b>		<b>14</b>	<b>0</b>	<b>12</b>	<b>21</b>

\*It is treated as practical course for evaluation

**Objective**

- To Prepare Students in use of the Basics of the English Language.

**Writing Skills:** Paragraph Writing-Report writing, Technical writing -Unity-Plain English

**Technical Writing Skills:** Business Proposals- Business Correspondence: Enquiry, complaint, sales letters - Precise writing-Para phrasing, summary writing on graphs, tables, charts etc....

**Functional Skills:** Technical Presentation Skills- Inter personal Communication- Group Discussions-Pamphlet and brochure designing

**Soft Skills:** Relationship between Soft skills and Communication Skills- Leadership Skills-Team management Skills-Lateral thinking-Negotiation skills –Telephone etiquettes.

**Prose or Poetry:** Collection of two to three prose or poetry pieces at the discretion of the teacher for enhancing the literary sensibility of the students.

**Outcome**

- The students will have knowledge of the various uses of English in their professional environment and they will be able to communicate themselves effectively in their chosen profession

**Text Books Suggested**

1. Meenakshi Raman and Sangeeta Sharma, Technical Communication, OUP Publication, 2005.
2. John Sealy. The Oxford guide to effective writing and Speaking, OUP publication, 2007.
3. K. Alex. Soft Skills, S. Chand Publication, 2010

**Reference Book**

1. David Lindsay, "A Guide to Scientific Writing", Macmillan, 1995

**Activities for Practice**

Virtual Course: Presentations, letter writing practice, soft skills practice, Mock interviews, Group discussions, Writing skills practice

## MA101 DIFFERENTIAL CALCULUS AND ALGEBRA

L - T - P - C: 3 - 0 - 0 - 3

**Unit-I:** Matrix Theory: Elementary row and column operations on a matrix, Rank of matrix, Normal form, Inverse of a matrix using elementary operations, Consistency and solutions of systems of linear equations using elementary operations, linear dependence and independence of vectors, Characteristic roots and vectors of a matrix, Caley - Hamillton theorem (statement only) and its applications, canonical form by linear and orthogonal transformations.

**Unit-II:** Sequences: Sequences of real numbers – Limit of a sequence – Convergent and divergent sequences–sub sequence- Cauchy's sequence – monotone convergence theorem (without proof)- Sequence with recurrence relations.

**Unit-III:** Infinite series: Convergence Tests for positive term series – Comparison, Root, Ratio and Raabe's tests- Alternating series – Leibnitz's rule – Absolute and Conditional Convergence.

**Unit-IV:** Differential Calculus: Rolle's theorem; Mean value theorem; Taylor's and Maclaurin's theorems (without proof) with remainders, Functions of several variables, Partial Differentiation, Total Differentiation, Euler's theorem and generalization, maxima and minima of functions of several variables (two and three variables) – Lagrange's method of Multipliers, Change of variables, Jacobians. Asymptotes and curvature, Curve tracing.

**Unit-V:** Vector Calculus: Scalar and Vector fields; Vector Differentiation; Level surfaces directional derivative, Gradient of scalar field, Divergence and Curl of a vector field, Laplacian, Line and surface integrals, Green's theorem in plane, Gauss Divergence theorem, Stokes' theorem (Without Proof).

### Text Books:

1. Erwyn Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 8th Edition.
2. T. Veera Rajan, *Engineering Mathematics* (For First Year), Mc Graw Hill Education, 2007.

### Reference Books:

1. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 2002.
2. M. K. Venkataraman, *Linear Algebra*, The National Publishing Co, 1999.

# EE101 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L - T - P - C: 3 - 0 - 0 - 3

## COURSE OBJECTIVE

- To enable the students in gaining knowledge about the fundamentals of Electrical and Electronics engineering.

**UNIT I:** Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law. Series and Parallel DC circuits. Concepts of AC Circuits- rms value, average value, form and peak factors. Simple RL, RC and RLC series and parallel circuits Concept of real and reactive power – Power factor. Introduction to three phase systems - types of connections, relationship between line and phase values.

**UNIT II:** Definition of mmf, flux and reluctance, leakage flux, fringing, magnetic materials and B-H relationship. Faraday's laws of electromagnetic induction. Basic Working principle and construction of electrical Machines. Introduction to electrical measuring instruments.

**UNIT III:** Types of wiring-staircase & corridor wiring, wiring accessories. Basic safety measures at home and industry- earthing. Electrical tariff, energy audit and importance of energy saving. Simple layout of generation-various energy resources, transmission & distribution of power. The Laws of Illumination-Electric lamps.

**UNIT IV:** Semiconductor: Energy band diagram, Intrinsic and Extrinsic semiconductors, PN junction diodes and Zener diodes - characteristics. Transistors: PNP and NPN transistors - theory of operation - Transistor configurations -characteristics - comparison. Special semiconductor devices: FET - SCR - LED - V I characteristics - applications.

**UNIT V:** Digital Fundamentals: Number systems - Boolean Theorems - DeMorgan's Theorem - Logic gates -Implementation of Boolean Expression using Gates. Integrated Circuits: IC fabrication - Monolithic Technique, Introduction to Operational Amplifier.

## TEXT BOOKS

1. Muthusubramanian.R, Salivahanan.S, Muraleedharan.K.A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw - Hill, 1999.
2. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI, 2nd Edition, 2010.

## REFERENCE BOOKS

1. Thomas L. Floyd "Electronic devices", Addison Wesley Longman (Singapore) Pvt. Ltd.,
2. 5th Edition.
3. Kothari D P and Nagrath I J, Basic Electrical Engineering , Tata McGraw Hill,1991.
4. Mehta V K ,Principles of Electronics S Chand & Co,1980.
5. Mithal G K, Electronic Devices and Circuits, Khanna Publications, 1997.
6. Kalsi H S, "Electronics Instrumentation", ISTE publication, 1995.
7. Huges, "Electrical and Electronics Technology", Pearson, 10th Edition, 2011.

## **COURSE OUTCOMES**

Students will be able to

1. Understand the basics of electric circuits.
2. Understand the basics of electromagnetic laws.
3. Understand the basic working principle of DC and AC machines.
4. Understand the concepts of power generation, energy saving, illumination, electric lamps, protective devices for safety.
5. Understand the basic operation and characteristics of electron devices.

Understand the fundamentals of digital electronics and integrated circuits.

**Unit-I:** Fundamentals: Mechanics and its relevance, concepts of forces, laws of mechanics parallelogram law, Lami's theorem, Law of polygon, concept of free-body diagram, centroids, center of gravity, area moment of inertia, mass moment of inertia – simple and composite planes, simple truss analysis, Numerical problems.

**Unit-II:** Friction: Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes, simple screw jack – velocity ratio, mechanical advantage, efficiency, Numerical problems.

**Unit-III:** Statics: Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients, Numerical problems.

**Unit-IV:** Kinematics: Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical problems.

**Unit-V:** Dynamics: Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, vibrations of simple systems, Numerical problems.

**Text Books**

1. S. Timoshenko and D. H. Young, Engineering Mechanics, McGraw Hill, 2006.
2. K. L. Kumar and V. Kumar, Engineering Mechanics, Tata McGraw Hill, 2011.
3. M. S. Palanichamy and S. Nagan, Engineering Mechanics – Statics & Dynamics, Tata McGraw Hill, 2002.
4. E. P. Popov, Engineering Mechanics of Solids, Prentice Hall, 1998.

**Reference Books**

1. I. H. Shames and G. K. M. Rao, Engineering Mechanics – Static and Dynamics, Pearson Education, 2009.
2. F. P. Beer and E. R. Johnson Jr, Vector Mechanics for Engineers, McGraw Hill, 2009.
3. J. S. Rao and K. Gupta, Introductory Course on Theory and Practice of Mechanical Vibrations, New Age International, 1999.



**Objectives:**

- To enable the students to refresh their basics of Physics and orient themselves in implementation of concepts in engineering.
- To give an exposure on basics of quantum mechanics and statistical physics.
- To provide fundamentals of Solid state physics, which give foundation for engineering Physics and Materials Science.
- To enable the students to get exposure on different types advanced materials in engineering, properties and application in the field of engineering

**Unit 1: Waves and Oscillations:** Wave motion- Travelling wave in one dimension-Wave equation examples-Superposition of waves and standing waves-Simple harmonic motion - energy of SHM examples: Simple pendulum, LC circuit-damped oscillations-forced oscillations and resonance conditions; Absorption coefficient-reverberation-reverberation time -Sabine's formula-Acoustics of buildings. Theory of interference of light- Newton's rings, Diffraction-Grating,-Polarization-Applications.

**Unit 2: Quantum mechanics:** Inadequacy of classical mechanics-Wave and particle duality of radiation-de Broglie concept of matter waves-Heisenberg's uncertainty principle-Schrodinger wave equation-Interpretation of wave function- Eigen values and Eigen functions-Superposition principle-Particle confined in one dimensional infinite square well potential, (potential barrier, tunneling-notion only)-Harmonic oscillator.

**Unit 3: Statistical Mechanics:** A Simple thermodynamic System, Thermodynamic processes, Second law of thermodynamics; entropy and temperature, The Boltzmann distribution, Classical averages, Quantum distributions-FD and BE, the quantum gas.

**Unit 4: Solid state Physics:** Crystalline and amorphous solids-system of crystals symmetry operation single crystal-defects in solids-Miller indices-atomic radius coordination number-Atomic packing factor calculation-Bragg's law. Drude theory of electrical conductivity, Free electron theory (classical and quantum), band theory of solids, semiconductors, superconductivity-types, Meissner effect, applications; Magnetism-types 4 and properties- Hard and soft magnetic materials, applications; Dielectrics-types of polarization, internal fields, Clausius Mosotti equation; Introduction to advanced materials.

**Unit 5: Lasers and fiber optics**

Spontaneous and stimulated emissions-Einstein's coefficients- Population inversion and lasing action, Coherence-Properties and types of lasers-Applications; Fermat's principle and Snell's law-Optical fiber-Numerical aperture-Types of fibers- Fiber optics communication principle-Fiber optic sensors.

**Outcomes:**

- Fundamental knowledge of students obtained in school will get refreshed while handling topics with mathematical approach.
- Students will also get an exposure on topics of modern physics and connectivity of thermodynamics, statistical physics and quantum physics providing.
- Student will get exposure on physics of materials science for the advancements in the materials science.
- Unit 3, 4 and 5 will provide the basis for core engineering courses.

**Text books:**

1. M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi (2014).
2. R.K. Gaur and S.L. Gupta ,Engineering Physics, DhanpatRai Publications (P) Ltd., 8thedn., New Delhi (2001)
3. V. Rajendran, Materials Science, Tata McGraw-Hill-2011
4. R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers, 9th edition, Cengage Learning,2014
5. Anthony R. West, Solid State Chemistry and its Applications, John Wiely and sons 2nd Edition. 2014
6. Arthur Beiser, Concepts of Modern Physics., Tata McGraw-Hill, New Delhi (2010).

**Reference books:**

1. Halliday, Resnic and Walker, Fundamentals of Physics, 9th Ed., John Wiley & sons (2011).
2. Walter Greiner, Ludwig Neise, Horst Stocker and D. Rischke, Thermodynamics and Statistical Mechanics, Springer (1997).
3. Richard P. Feynman ,The Feynman Lectures on Physics - Vol. I,II and III: The New Millennium Edition (2012).
4. Rolf. E. Hummel, Electronic Properties of Materials, Springer (2001).

**Objectives:**

- Enabling the Students to learn the basic principles of electrochemistry, Corrosion studies, Organic Chemistry, Spectroscopy, Coordination and Applied Chemistry.

**UNIT I - Electrochemistry and Corrosion:** Introduction to Electrochemistry, Electrolytic and galvanic cells - EMF, Reference Electrode - Weston standard cell, hydrogen electrode, calomel electrode, glass electrode, reversible and irreversible cells, concentration cell – Hydrogen-Oxygen fuel cells. Corrosion: Dry and wet corrosion - General mechanism, Types of corrosion, Factors affecting corrosion - Corrosion protection – Electro and Electroless Plating.

**UNIT II - Organic Chemistry and UV-Vis Spectroscopy:** Carbon-carbon bond properties, homolytic and heterolytic cleavage of carbon-carbon bonds,  $S_N1$  and  $S_N2$ ,  $E^1$  and  $E^2$  reactions, aromatic nucleophilic substitution, aromatic electrophilic substitution, Baeyer-Villiger oxidation, MPV reduction. UV-Visible Spectroscopy: origin of UV and visible spectra, colour in organic compounds, absorption by organic and inorganic molecules, Woodward-Fieser rules for calculating absorption maximum in dienes and  $\alpha$ ,  $\beta$ -unsaturated carbonyl compounds.

**UNIT – III Coordination Chemistry:** Formation and types of metal complexes, EAN rule, 16 and 18 electron rule, crystal field theory, CFSE, color and magnetism of transition metal ions, metal carbonyls (Ni & Fe) - bonding and structure, Organometallic compounds in catalysis - hydrogenation, hydroformylation and polymerization of olefin, Chemistry of hemoglobin, Bohr effect.

**UNIT – IV Water:** Sources, hard and soft water, estimation of hardness by EDTA method, softening of water - zeolite process, demineralization by ion exchangers, boiler feed water, internal treatment methods, specifications for drinking water, BIS and WHO standards, treatment of water for domestic use, desalination, reverse osmosis, electro dialysis.

**UNIT – V Fuels and Lubricants:** Fuels - classification, examples and relative merits, types of coal, determination of calorific value of solid fuels - Bomb calorimeter - Theoretical oxygen demand, proximate and ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems, Lubricants – definition, theories of lubrication, characteristics of lubricants – viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point and carbon residue, additives to lubricants.

**TEXT BOOKS**

1. P.C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2015.
2. J. March, Advanced Organic Chemistry, Wiley Eastern, New Delhi, 2012.
3. W. Kemp, Organic Spectroscopy, Palgrave, New York, 2008.

**REFERENCE BOOKS**

1. R. Gopalan, D. Venkappayya and N. Sulochana, Engineering Chemistry, Vikas Publishing House, New Delhi, 2017.
2. J.C. Kuriacose, J. Rajaram, Chemistry in Engineering and Technology, Vol I & II, Tata McGraw Hill publishing Company Ltd, New Delhi, 1984.
3. P.W. Atkins, Physical Chemistry, Oxford University Press, 2006.
4. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry - Principles of Structure and Reactivity, Harper Collins College Publishers, New York, 2011.

## **CE102 BASIC ENERGY, ENVIRONMENT AND AGRICULTURAL ENGINEERING**

**L - T - P - C: 3 - 0 - 0 - 3**

**Unit-1:** Present energy resources in India and its sustainability - Different type of conventional power plant-Energy demand scenario in India - Advantage and disadvantage of conventional Power Plants – Conventional vs. non-conventional power generation - Basics of Solar Energy- Solar thermal and Solar photovoltaic systems

**Unit-2:** Power and energy from wind turbines-Types of wind turbines-Biomass resources-Biomass conversion technologies- Feedstock pre-processing and treatment methods-Introduction to geothermal energy and tidal energy.

**Unit-3:** Air pollution - Sources, effects, control, air quality standards -Air pollution act, air pollution measurement. Water pollution-Sources, impacts, control, and measure –Quality of water for various purposes-Noise pollution - Sources, impacts, control, measure.

**Unit-4:** Pollution aspects of various industries- Impacts of fossil fuels and transport emissions – impacts - Municipal solid waste generation and management - Swachh Bharat Mission – Challenges and activities - Environment and forest conservation – Greenhouse gases and global warming- climate change

**Unit-5:** Introduction to agriculture engineering -Major crops of India–Types and categories of crops-Types of farming and cultivation procedures-Different monsoon seasons-Types of irrigation systems-Major draughts-Agricultural machinery-Dairy farming and its economic importance

### **TEXT BOOKS**

1. B. H. Khan, Non-Conventional Energy Resources-The McGraw –Hill Second edition, 2009.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Prentice Hall, 2nd Edition, 2003.
3. G.L. Asawa, Elementary Irrigation Engineering, New Age International, First Edition, 2014
4. Sukhpal Singh, Agricultural Machinery Industry in India, Allied Publishers, New Delhi, 2010
5. Dilip R. Shah, Co-Operativization Liberalization And Dairy Industry In India, A.B.D. Publishers, 2000

### **REFERENCES**

1. Unleashing the Potential of Renewable Energy in India –World bank report.
2. G. Boyle, Renewable energy: Power for a sustainable future, Oxford University press, 2004.

**Objectives:**

- To introduce the concepts, significance and importance of Power Plant Engineering, Internal Combustion Engines, Refrigeration and Air Conditioning
- To introduce the concepts of Surveying, Civil Materials, and Building Components

**Unit-I**

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydroelectric and Nuclear Power plants – Merits and Demerits – Pumps and Turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

**Unit-II**

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boilers, Classification of Boilers - Fire tube and Water Tube Boilers.

**Unit-III**

Terminology of Refrigeration and Air Conditioning, Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

**Unit-IV**

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

**Unit-V**

Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring –plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

**Outcomes:**

- Upon completion of this course, the students can able to understand the power plant engineering, IC Engines, R&AC, Surveying, Civil Materials and Building Components.

**Text Books:**

- 1.Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, (2005).
- 2.Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).

**Reference books:**

- 1.Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New Delhi, 2002.
- 2.El.Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co.,1985.
- 3.Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media Promoters Publishers Pvt. Ltd., Bombay, 2004.
- 4.Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, (1996).
- 5.Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).
- 6.Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.
- 7.Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, (2000).

**Objectives and outcome:**

- To enable the students to understand fundamentals of measurement, error analysis and its impact on results.
- Exposure and to understand basic experiments in different areas of Physics.
- Experiments emphasising the topics covered in the course PH101.
- Fundamentals of measurements, error detection, error analysis and usage of scientific calculator in engineering.

1. Simple harmonic motion.
2. Sonometer- frequency of tuning fork/AC (Melde's technique).
3. Determination of Young's modulus- Searle's dynamical method.
4. Modulus of rigidity using torsion pendulum.
5. Thermal conductivity of poor conductor –Lee's disc method.
6. Measurement of temperature using thermocouple.
7. Specific heat of liquids by Newton's law of cooling.
8. B-H curve of ferromagnetic materials.
10. Determination of magnetic field along the axis of a circular coil.
11. (i) Conversion of Galvanometer into ammeter and voltmeter.  
(ii) Calibration of voltmeter-Potentiometer.
12. Series LCR circuit-resonance phenomenon.
13. Newton's rings- determination of radius of curvature of a lens.
14. Determination of wavelength, spot size and divergence of laser.
15. I-V Characteristics of a PN junction diode and Zener diode.
16. Determination of resistivity and band gap of a semiconductor.
17. Charge-discharge characteristics of RC circuit.
18. Introduction to CRO- Lissajous figures.
19. Determination of Planck's constant
20. Verification of Photo-electric effect.

**Reference books:**

1. C.L Arora, B.Sc. Practical Physics, S. Chand & Co. (2012).
2. Singh Harnam and Hemne P.S., B.Sc. Practical Physics, S. Chand & Company (2002)
3. J.D. Wilson and Cecilia A. Hernandez-Hall, Physics laboratory experiments, 7th edition, Cengage Learning (2009).
4. R.A. Dunlap, Experimental Physics: Modern Methods, Oxford University Press (1997).

**Objectives:**

- Enabling the Students to understand the basics concept of Instrumentation technique, corrosion studies, coal analysis and estimation of water samples.
1. Percentage purity of bleaching powder
  2. pH metric titration
  3. Conductometric titration
  4. Potentiometric titration
  5. Determination of corrosion rate of mild steel in acid medium by weight loss method
  6. Estimation of total alkalinity in the given water sample
  7. Estimation of carbonate, noncarbonated and total hardness in the given water sample
  8. Estimation of dissolved oxygen in waste water
  9. Estimation of  $\text{Fe}^{2+}$  by external indicator
  10. Estimation of proximate analysis of Coal.

**Reference Book**

1. Laboratory Manual, Department of Chemistry, NITT

**Objectives:**

Irrespective of engineering discipline, it has become mandatory to know the basics of engineering graphics. The student is expected to possess the efficient drafting skill depending on the operational function in order to perform day to day activity.

- To provide neat structure of industrial drawing.
- Enables the knowledge about position of the component and its forms
- Interpretation of technical graphics assemblies
- Preparation of machine components and related parts

**UNIT-I**

Fundamentals Drawing standard - BIS, dimensioning, lettering, type of lines, scaling-conventions. Geometrical constructions: Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon – conic sections – ellipse – parabola – hyperbola - cycloid – trochoid.

**UNIT-II**

Orthographic projection: Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of points lying in four quadrants, Orthographic projection of lines parallel and inclined to one or both planes Orthographic projection of planes inclined to one or both planes. Projections of simple solids - axis perpendicular to HP, axis perpendicular to VP and axis inclined to one or both planes.

**UNIT-III**

Sectioning of solids: Section planes perpendicular to one plane and parallel or inclined to other plane. Intersection of surfaces: Intersection of cylinder & cylinder, intersection of cylinder & cone, and intersection of prisms.

**UNIT-IV**

Development of surfaces: Development of prisms, pyramids and cylindrical & conical surfaces. Isometric and perspective projection: Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection, perspective projection of simple solids prisms, pyramids and cylinders by visual ray method and vanishing point method.

**UNIT-V**

Computer aided drafting: Introduction to computer aided drafting package to make 2-D drawings. 2D drafting commands (Auto CAD) for simple shapes – Dimensioning (Based on the assignment, student will be evaluated for this unit)

**Outcomes:**

On completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.



**TEXT BOOKS:**

- 1.Natarajan, K. V., A text book of Engineering Graphics, Publication: Dhanalakshmi Publishers, Chennai, 2006.
- 2.Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, Pub.: New Age International, 2009.

**REFERENCE BOOKS:**

1. Jolhe, D. A., Engineering drawing, Publication: Tata McGraw Hill, 2008
2. Shah, M. B. and Rana, B. C., Engineering Drawing, Pub.: Pearson Education, 2009.
3. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Luzzader, Warren.J. and Duffjohn M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
- 5.Bhatt,N. D and Panchal,V.M.,Engineering Drawing, Publication: Charotar Publishing House, 2010.

**Objectives:**

- Introduction to the use of tools and machinery in Carpentry, Welding, Foundry, Fitting and Sheet Metal Working.

**Carpentry**

Wood sizing exercise in planning, marking, sawing, chiseling and grooving to make

1. Half lap joint
2. Cross lap joint

**Welding**

Exercise in arc welding for making

1. Lap joint
2. Butt joint

**Foundry**

Preparation of sand mould for the following

1. Flange
2. Anvil

**Fitting**

Preparation of joints, markings, cutting and filling for making

1. V-joint
2. Square Fitting

**Sheet metal**

Making of small parts using sheet metal

1. Tray/ Dust Pan
2. Funnel

**Smithy Work**

Reforming the shape using Smithy work

1. Round rod to Square rod
2. Round rod to Hook

**Plumbing**

1. Making Series PVC pipe connection for checking the flow rate
2. Making Parallel PVC pipe connection for checking the flow rate

**Assembling and Dismantling**

1. Dismantling of front and back wheel
2. Assembling of bicycle back wheel
3. Dismantling of Pumps

**Usage**

1. Demonstration of Bearing, Pulley and Hydraulic Jack

**Outcomes:**

- Ability to fabricate carpentry components,
- Ability to use welding equipments to join the structures.
- Ability to make the mould using patterns and different fittings
- Ability to fabricate sheet metal, components,
- Ability to fabricate electrical and electronics circuits.
- Ability to reform the shape of the metals
- Ability to understand the mechanism of bicycle, pumps, bearing, pulley and Jack

**Objective:**

- To train students in Soft skills and Technical Communication Skills.

**Listening Skills:** Importance of Listening skills in Technical World – Types of Listening- Listening for information, inference and evaluation-Note Making.

**Reading Skills:** Importance of Reading Skills- Reading strategies- Reading for information, inference and evaluation. (News papers, Scientific Research, Desired reading materials), Note Making.

**Reading for Research Proposes:** Reading Technical Reports- How to read a Journal article.

**Use of Soft Skills:** Discussion- Interview- Presentation.

**Reference Skills:** Using a Dictionary, graphs, glossary, index, bibliography etc.

**Outcome:** The students will be able to express themselves in a meaningful manner at different levels of people in their academic and social domains.

**Text Books Suggested:**

1. Meenakshi Raman and Sangeeta Sharma, Technical Communication, OUP Publication, 2005.
2. M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill,2005

**Reference Books**

1. David Lindsay,” A Guide to Scientific Writing”, Macmillan, 1995

**Activities for Practise:**

Activities designed on Speaking and listening Skills based on the theory syllabus. Like Pair work Activities, role plays, Jam sessions, Debates, Movie clips to illustrate non verbal communication, Varieties of English practice, Skits, Mock interview sessions, grammar games and practice, etc.,

# MA102 INTEGRAL CALCULUS AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

L –T –P - C: 3 – 0 – 0 -3

**Unit-I:** Integral Calculus: Fundamental theorem of integral calculus and mean value theorems, Beta and Gamma integrals, Elementary properties, Differentiation under integral sign.

**Unit-II:** Multiple Integrals: Double and triple integrals, surface areas by double integrals. Volumes by double and triple integrals change of variables in double and triple integrals.

**Unit-III:** Ordinary differential equations of first order: Separable equations, equations reducible to separable form, exact equations, integrating factors, linear first order equations, Bernoulli's equation, Orthogonal trajectories, Newton's law of cooling, Law of Natural growth and Decay.

**Unit-IV:** Higher order Ordinary differential equations: Higher order linear equations with constant coefficients. Euler and Cauchy's equations, method of variation of parameters, system of linear Differential equations with constant coefficients.

**Unit-V:** Laplace Transformations: Laplace transform, Inverse Laplace transform, properties of Laplace transforms, Laplace transforms of unit step function, impulse function and periodic function, convolution theorem, Solution of ordinary differential equations with constant coefficients and system of linear differential equations with constant coefficients using Laplace transform.

## Text Books:

1. Erwyn Kreyszig, *Advanced Engineering Mathematics*, John Wiley and Sons, 10th Edition, 2010.
2. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publications, 42nd Edition, 2012.
3. T. Veera Rajan, *Engineering Mathematics (For First Year)*, Mc Graw Hill Education, 2007.

## Reference Books:

1. T.M. Apostol, *Calculus*, Volume I & II, 2nd Edition, John Wiley & Sons (Asia), 2005.
2. M.D. Greenberg, *Advanced Engineering Mathematics*, 2nd Edition, Pearson Education Inc. (First Indian reprint), 2002.
3. M. K. Venkataraman, *Linear Algebra*, the National Publishing Co, 1999.

**Unit-I:** Fundamentals: Mechanics and its relevance, concepts of forces, laws of mechanics parallelogram law, Lami's theorem, Law of polygon, concept of free-body diagram, centroids, center of gravity, area moment of inertia, mass moment of inertia – simple and composite planes, simple truss analysis, Numerical problems.

**Unit-II:** Friction: Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes, simple screw jack – velocity ratio, mechanical advantage, efficiency, Numerical problems.

**Unit-III:** Statics: Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients, Numerical problems.

**Unit-IV:** Kinematics: Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical problems.

**Unit-V:** Dynamics: Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, vibrations of simple systems, Numerical problems.

#### **Text Books**

1. S. Timoshenko and D. H. Young, Engineering Mechanics, McGraw Hill, 2006.
2. K. L. Kumar and V. Kumar, Engineering Mechanics, Tata McGraw Hill, 2011.
3. M. S. Palanichamy and S. Nagan, Engineering Mechanics – Statics & Dynamics, Tata McGraw Hill, 2002.
4. E. P. Popov, Engineering Mechanics of Solids, Prentice Hall, 1998.

#### **Reference Books**

1. I. H. Shames and G. K. M. Rao, Engineering Mechanics – Static and Dynamics, Pearson Education, 2009.
2. F. P. Beer and E. R. Johnson Jr, Vector Mechanics for Engineers, McGraw Hill, 2009.
3. J. S. Rao and K. Gupta, Introductory Course on Theory and Practice of Mechanical Vibrations, New Age International, 1999.

**Objectives:**

- Enabling the Students to learn the basic principles of electrochemistry, Corrosion studies, Organic Chemistry, Spectroscopy, Coordination and Applied Chemistry.

**UNIT I - Electrochemistry and Corrosion:** Introduction to Electrochemistry, Electrolytic and galvanic cells - EMF, Reference Electrode - Weston standard cell, hydrogen electrode, calomel electrode, glass electrode, reversible and irreversible cells, concentration cell – Hydrogen-Oxygen fuel cells. Corrosion: Dry and wet corrosion - General mechanism, Types of corrosion, Factors affecting corrosion - Corrosion protection – Electro and Electroless Plating.

**UNIT II - Organic Chemistry and UV-Vis Spectroscopy:** Carbon-carbon bond properties, homolytic and heterolytic cleavage of carbon-carbon bonds,  $S_N1$  and  $S_N2$ ,  $E^1$  and  $E^2$  reactions, aromatic nucleophilic substitution, aromatic electrophilic substitution, Baeyer-Villiger oxidation, MPV reduction. UV-Visible Spectroscopy: origin of UV and visible spectra, colour in organic compounds, absorption by organic and inorganic molecules, Woodward-Fieser rules for calculating absorption maximum in dienes and  $\alpha$ ,  $\beta$ -unsaturated carbonyl compounds.

**UNIT – III Coordination Chemistry:** Formation and types of metal complexes, EAN rule, 16 and 18 electron rule, crystal field theory, CFSE, color and magnetism of transition metal ions, metal carbonyls (Ni & Fe) - bonding and structure, Organometallic compounds in catalysis - hydrogenation, hydroformylation and polymerization of olefin, Chemistry of hemoglobin, Bohr effect.

**UNIT – IV Water:** Sources, hard and soft water, estimation of hardness by EDTA method, softening of water - zeolite process, demineralization by ion exchangers, boiler feed water, internal treatment methods, specifications for drinking water, BIS and WHO standards, treatment of water for domestic use, desalination, reverse osmosis, electro dialysis.

**UNIT – V Fuels and Lubricants:** Fuels - classification, examples and relative merits, types of coal, determination of calorific value of solid fuels - Bomb calorimeter - Theoretical oxygen demand, proximate and ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems, Lubricants – definition, theories of lubrication, characteristics of lubricants – viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point and carbon residue, additives to lubricants.

**TEXT BOOKS**

1. P.C. Jain and M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2015.
2. J. March, Advanced Organic Chemistry, Wiley Eastern, New Delhi, 2012.
3. W. Kemp, Organic Spectroscopy, Palgrave, New York, 2008.

**REFERENCE BOOKS**

1. R. Gopalan, D. Venkappayya and N. Sulochana, Engineering Chemistry, Vikas Publishing House, New Delhi, 2017.
2. J.C. Kuriacose, J. Rajaram, Chemistry in Engineering and Technology, Vol I & II, Tata McGraw Hill publishing Company Ltd, New Delhi, 1984.
3. P.W. Atkins, Physical Chemistry, Oxford University Press, 2006.
4. J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry - Principles of Structure and Reactivity, Harper Collins College Publishers, New York, 2011.

**Objectives:**

- To enable the students to refresh their basics of Physics and orient themselves in implementation of concepts in engineering.
- To give an exposure on basics of quantum mechanics and statistical physics.
- To provide fundamentals of Solid state physics, which give foundation for engineering Physics and Materials Science.
- To enable the students to get exposure on different types advanced materials in engineering, properties and application in the field of engineering

**Unit 1: Waves and Oscillations:** Wave motion- Travelling wave in one dimension-Wave equation examples-Superposition of waves and standing waves-Simple harmonic motion - energy of SHM examples: Simple pendulum, LC circuit-damped oscillations-forced oscillations and resonance conditions; Absorption coefficient-reverberation-reverberation time -Sabine's formula-Acoustics of buildings. Theory of interference of light- Newton's rings, Diffraction-Grating,-Polarization-Applications.

**Unit 2: Quantum mechanics:** Inadequacy of classical mechanics-Wave and particle duality of radiation-de Broglie concept of matter waves-Heisenberg's uncertainty principle-Schrodinger wave equation-Interpretation of wave function- Eigen values and Eigen functions-Superposition principle-Particle confined in one dimensional infinite square well potential, (potential barrier, tunneling-notion only)-Harmonic oscillator.

**Unit 3: Statistical Mechanics:** A Simple thermodynamic System, Thermodynamic processes, Second law of thermodynamics; entropy and temperature, The Boltzmann distribution, Classical averages, Quantum distributions-FD and BE, the quantum gas.

**Unit 4: Solid state Physics:** Crystalline and amorphous solids-system of crystals symmetry operation single crystal-defects in solids-Miller indices-atomic radius coordination number-Atomic packing factor calculation-Bragg's law. Drude theory of electrical conductivity, Free electron theory (classical and quantum), band theory of solids, semiconductors, superconductivity-types, Meissner effect, applications; Magnetism-types 4 and properties- Hard and soft magnetic materials, applications; Dielectrics-types of polarization, internal fields, Clausius Mosotti equation; Introduction to advanced materials.

**Unit 5: Lasers and fiber optics**

Spontaneous and stimulated emissions-Einstein's coefficients- Population inversion and lasing action, Coherence-Properties and types of lasers-Applications; Fermat's principle and Snell's law-Optical fiber-Numerical aperture-Types of fibers- Fiber optics communication principle-Fiber optic sensors.

**Outcomes:**

- Fundamental knowledge of students obtained in school will get refreshed while handling topics with mathematical approach.
- Students will also get an exposure on topics of modern physics and connectivity of thermodynamics, statistical physics and quantum physics providing.
- Student will get exposure on physics of materials science for the advancements in the materials science.
- Unit 3, 4 and 5 will provide the basis for core engineering courses.

**Text books:**

1. M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi (2014).
2. R.K. Gaur and S.L. Gupta ,Engineering Physics, DhanpatRai Publications (P) Ltd., 8thedn., New Delhi (2001)
3. V. Rajendran, Materials Science, Tata McGraw-Hill-2011
4. R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers, 9th edition, Cengage Learning.2014
5. Anthony R. West, Solid State Chemistry and its Applications, John Wiely and sons 2nd Edition. 2014
6. Arthur Beiser, Concepts of Modern Physics., Tata McGraw-Hill, New Delhi (2010).

**Reference books:**

1. Halliday, Resnic and Walker, Fundamentals of Physics, 9th Ed., John Wiley & sons (2011).
2. Walter Greiner, Ludwig Neise, Horst Stocker and D. Rischke, Thermodynamics and Statistical Mechanics, Springer (1997).
3. Richard P. Feynman ,The Feynman Lectures on Physics - Vol. I,II and III: The New Millennium Edition (2012).
4. Rolf. E. Hummel, Electronic Properties of Materials, Springer (2001).



**Objectives**

- To learn the fundamentals of computers.
- To learn the problem solving techniques in writing algorithms and procedures.
- To learn the syntax and semantics for C programming language.
- To understand the constructs of structured programming such as conditions, iterations, arrays, functions and pointers.
- Analyze complex engineering problems to develop suitable solutions.

**Unit- I Fundamentals of Computer**

Introduction to computers – Computer Organization – Characteristics – Hardware and Software – Modes of operation – Types of programming languages – Developing a program.

**Unit- II Algorithms and Structured Programming**

Algorithms – Characteristics – Flowcharts - Principles of Structured programming – Sequential, Selective structures - Repetitive structures – Bounded, Unbounded and Infinite iterations.

**Unit-III Overview of C and Branching**

Introduction to C – C character set – Identifiers and Keywords – Data types – Constants – Variables – Declarations – Expressions – Statements – Symbolic constants – Operators– Library functions . Data input and output: Single character input and output – Entering input data – Writing output data – gets and puts functions. Control statements: Conditional- Branching- Looping- unconditional: Break- continue-goto.

**Unit-IV Functions & Arrays**

Functions: Overview- Defining a Function- Accessing a Function- Function Prototypes- Passing Argument to a Function- Recursion- Storage Classes: Automatic Variables- External (Global) Variables-Static Variables- Register variables. Arrays: Defining an Array- Processing an Array- Passing Array to function- Multidimensional Arrays.

**Unit-V Strings & Pointers**

Strings: Defining a String- NULL Character- Initialization of Strings- Reading and Writing a String- Processing Strings- Character Arithmetic- Library Functions for Strings. Pointers: Pointer Declaration-Passing Pointers to a Function-Pointers and One-dimensional Array- Dynamic Memory Allocation- Operations on Pointers- Pointers and Multidimensional Arrays- Array of Pointers- Command line arguments.

**Outcomes**

- Design algorithms for specified engineering problems.
- Knowledge of the syntax and semantics of C programming language.
- Ability to code a given logic in C language.
- Knowledge in using C language for solving engineering problems.

**Teaching and Evaluation guidelines**

- 40% on Analysis and Synthesis (Higher Order Thinking), 30% on Application (Medium Order Thinking), and 30% on Knowledge and Comprehension (Lower Order Thinking).

## **Text Books**

1. Byron Gottfried, "Programming with C", Third Edition, Tata McGraw Hill Education, 2010.
2. R.G. Dromey, "How to Solve it By Computers?", First edition, Prentice Hall, 2001 .

## **Reference Books**

1. J.R. Hanly and E.B. Koffman, "Problem Solving and Program Design in C", Sixth Edition, Pearson Education, 2009.
2. Paul Deital and Harvey Deital, "C How to Program", Seventh Edition, Prentice Hall, 2012.
3. YashavantKanetkar, "Let Us C", Twelfth Edition, BPB Publications, 2012.

# HM103 BASICS OF HUMAN LIFE SCIENCE

L - T - P - C: 2 - 0 - 2 - 2

## Unit I

Fundamentals of cognitive psychology — perception — attention — memory systems — remembering/forgetting events — memory distortions

## Unit II

Knowledge representation — language. Problem solving — reasoning and decision making.

## Unit III

Managing people — empathic listening — managing change — achieving excellence — influencing people — balancing work and life (stress) — making presentations — time management

## Unit IV

Emotional intelligence — social intelligence. Phantoms in the brain — creativity — lateral thinking — innovation — transactional analysis — team working — Personality development

## Unit V

Introduction to professional ethics — human values — work and environmental ethics.

## References:

1. Dale Timple A, creativity, Jaico publishing house, 2005.
2. Dalip Singh, Emotional intelligence at work, SAGE publication Inc, 2007.
3. DK book series, 2008.
4. Harris A Thomas, I am ok-you are ok, Arrow Books, 2012.
5. Harris Jr. E. Charles, Engineering ethics, concepts, and cases, Thomas Wordsworth, 2003.
6. Kellog T Ronald, Fundamental of cognitive psychology, SAGE publication Inc, 2012.
7. Ramachandran V. S. and Sandra Blakeslee, phantoms in the brain, Hopper Collins, 2012.

## ME101 Basic Mechanical and Civil Engineering

L – T – P - C: 2 – 0 – 0 - 2

### Objectives:

- To introduce the concepts, significance and importance of Power Plant Engineering, Internal Combustion Engines, Refrigeration and Air Conditioning
- To introduce the concepts of Surveying, Civil Materials, and Building Components

### Unit-I

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydroelectric and Nuclear Power plants – Merits and Demerits – Pumps and Turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

### Unit-II

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boilers, Classification of Boilers - Fire tube and Water Tube Boilers.

### Unit-III

Terminology of Refrigeration and Air Conditioning, Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

### Unit-IV

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

### Unit-V

Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring –plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

### Outcomes:

- Upon completion of this course, the students can able to understand the power plant engineering, IC Engines, R&AC, Surveying, Civil Materials and Building Components.

### Text Books:

- 1.Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, (2005).
- 2.Venugopal K. and Prahuraja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).

### Reference books:

- 1.Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New Delhi, 2002.
- 2.El.Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co.,1985.
- 3.Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media Promoters Publishers Pvt. Ltd., Bombay, 2004.
- 4.Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, (1996).
- 5.Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).
- 6.Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

7. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

**Unit-1:** Present energy resources in India and its sustainability - Different type of conventional power plant-Energy demand scenario in India - Advantage and disadvantage of conventional Power Plants – Conventional vs. non-conventional power generation - Basics of Solar Energy- Solar thermal and Solar photovoltaic systems

**Unit-2:** Power and energy from wind turbines-Types of wind turbines-Biomass resources- Biomass conversion technologies- Feedstock pre-processing and treatment methods- Introduction to geothermal energy and tidal energy.

**Unit-3:** Air pollution - Sources, effects, control, air quality standards -Air pollution act, air pollution measurement. Water pollution-Sources, impacts, control, and measure –Quality of water for various purposes-Noise pollution - Sources, impacts, control, measure.

**Unit-4:** Pollution aspects of various industries- Impacts of fossil fuels and transport emissions – impacts - Municipal solid waste generation and management - Swachh Bharat Mission – Challenges and activities - Environment and forest conservation – Greenhouse gases and global warming- climate change

**Unit-5:** Introduction to agriculture engineering -Major crops of India–Types and categories of crops-Types of farming and cultivation procedures-Different monsoon seasons-Types of irrigation systems-Major draughts-Agricultural machinery-Dairy farming and its economic importance

### **TEXT BOOKS**

1. B. H. Khan, Non-Conventional Energy Resources-The McGraw –Hill Second edition, 2009.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Prentice Hall, 2nd Edition, 2003.
3. G.L. Asawa, Elementary Irrigation Engineering, New Age International, First Edition, 2014
4. Sukhpal Singh, Agricultural Machinery Industry in India, Allied Publishers, New Delhi, 2010
5. Dilip R. Shah, Co-Operativization Liberalization And Dairy Industry In India, A.B.D. Publishers, 2000

### **REFERENCES**

1. Unleashing the Potential of Renewable Energy in India –World bank report.
2. G. Boyle, Renewable energy: Power for a sustainable future, Oxford University press, 2004.

**Objectives:**

- Enabling the Students to understand the basics concept of Instrumentation technique, corrosion studies, coal analysis and estimation of water samples.
1. Percentage purity of bleaching powder
  2. pH metric titration
  3. Conductometric titration
  4. Potentiometric titration
  5. Determination of corrosion rate of mild steel in acid medium by weight loss method
  6. Estimation of total alkalinity in the given water sample
  7. Estimation of carbonate, noncarbonated and total hardness in the given water sample
  8. Estimation of dissolved oxygen in waste water
  9. Estimation of  $\text{Fe}^{2+}$  by external indicator
  10. Estimation of proximate analysis of Coal.

**Reference Book**

1. Laboratory Manual, Department of Chemistry, NITT

**Objectives and outcome:**

- To enable the students to understand fundamentals of measurement, error analysis and its impact on results.
  - Exposure and to understand basic experiments in different areas of Physics.
  - Experiments emphasising the topics covered in the course PH101.
  - Fundamentals of measurements, error detection, error analysis and usage of scientific calculator in engineering.
1. Simple harmonic motion.
  2. Sonometer- frequency of tuning fork/AC (Melde's technique).
  3. Determination of Young's modulus- Searle's dynamical method.
  4. Modulus of rigidity using torsion pendulum.
  5. Thermal conductivity of poor conductor –Lee's disc method.
  6. Measurement of temperature using thermocouple.
  7. Specific heat of liquids by Newton's law of cooling.
  8. B-H curve of ferromagnetic materials.
  10. Determination of magnetic field along the axis of a circular coil.
  11. (i) Conversion of Galvanometer into ammeter and voltmeter.  
(ii) Calibration of voltmeter-Potentiometer.
  12. Series LCR circuit-resonance phenomenon.
  13. Newton's rings- determination of radius of curvature of a lens.
  14. Determination of wavelength, spot size and divergence of laser.
  15. I-V Characteristics of a PN junction diode and Zener diode.
  16. Determination of resistivity and band gap of a semiconductor.
  17. Charge-discharge characteristics of RC circuit.
  18. Introduction to CRO- Lissajous figures.
  19. Determination of Planck's constant
  20. Verification of Photo-electric effect.

**Reference books:**

1. C.L Arora, B.Sc. Practical Physics, S. Chand & Co. (2012).
2. Singh Harnam and Hemne P.S., B.Sc. Practical Physics, S. Chand & Company (2002)
3. J.D. Wilson and Cecilia A. Hernandez-Hall, Physics laboratory experiments, 7th edition, Cengage Learning (2009).
4. R.A. Dunlap, Experimental Physics: Modern Methods, Oxford University Press (1997).



**Objectives:**

Irrespective of engineering discipline, it has become mandatory to know the basics of engineering graphics. The student is expected to possess the efficient drafting skill depending on the operational function in order to perform day to day activity.

- To provide neat structure of industrial drawing.
- Enables the knowledge about position of the component and its forms
- Interpretation of technical graphics assemblies
- Preparation of machine components and related parts

**UNIT-I**

Fundamentals Drawing standard - BIS, dimensioning, lettering, type of lines, scaling-conventions. Geometrical constructions: Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon – conic sections – ellipse – parabola – hyperbola - cycloid – trochoid.

**UNIT-II**

Orthographic projection: Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of points lying in four quadrants, Orthographic projection of lines parallel and inclined to one or both planes Orthographic projection of planes inclined to one or both planes. Projections of simple solids - axis perpendicular to HP, axis perpendicular to VP and axis inclined to one or both planes.

**UNIT-III**

Sectioning of solids: Section planes perpendicular to one plane and parallel or inclined to other plane. Intersection of surfaces: Intersection of cylinder & cylinder, intersection of cylinder & cone, and intersection of prisms.

**UNIT-IV**

Development of surfaces: Development of prisms, pyramids and cylindrical & conical surfaces. Isometric and perspective projection: Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection, perspective projection of simple solids prisms, pyramids and cylinders by visual ray method and vanishing point method.

**UNIT-V**

Computer aided drafting: Introduction to computer aided drafting package to make 2-D drawings. 2D drafting commands (Auto CAD) for simple shapes – Dimensioning (Based on the assignment, student will be evaluated for this unit)

**Outcomes:**

On completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.

**TEXT BOOKS:**

- 1.Natarajan, K. V., A text book of Engineering Graphics, Publication: Dhanalakshmi Publishers, Chennai, 2006.
- 2.Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, Pub.: New Age International, 2009.

**REFERENCE BOOKS:**

1. Jolhe, D. A., Engineering drawing, Publication: Tata McGraw Hill, 2008
2. Shah, M. B. and Rana, B. C., Engineering Drawing, Pub.: Pearson Education, 2009.
3. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Luzzader, Warren.J. and Duffjohn M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
- 5.Bhatt,N. D and Panchal,V.M.,Engineering Drawing, Publication: Charotar Publishing House, 2010.

**Objectives:**

Introduction to the use of tools and machinery in Carpentry, Welding, Foundry, Fitting and Sheet Metal Working.

**Carpentry**

Wood sizing exercise in planning, marking, sawing, chiseling and grooving to make

1. Half lap joint
2. Cross lap joint

**Welding**

Exercise in arc welding for making

1. Lap joint
2. Butt joint

**Foundry**

Preparation of sand mould for the following

1. Flange
2. Anvil

**Fitting**

Preparation of joints, markings, cutting and filling for making

1. V-joint
2. Square Fitting

**Sheet metal**

Making of small parts using sheet metal

1. Tray/ Dust Pan
2. Funnel

**Smithy Work**

Reforming the shape using Smithy work

1. Round rod to Square rod
2. Round rod to Hook

**Plumbing**

3. Making Series PVC pipe connection for checking the flow rate
4. Making Parallel PVC pipe connection for checking the flow rate

**Assembling and Dismantling**

1. Dismantling of front and back wheel
2. Assembling of bicycle back wheel
3. Dismantling of Pumps

**Usage**

1. Demonstration of Bearing, Pulley and Hydraulic Jack

**Outcomes:**

- Ability to fabricate carpentry components,
- Ability to use welding equipments to join the structures.
- Ability to make the mould using patterns and different fittings
- Ability to fabricate sheet metal, components,
- Ability to fabricate electrical and electronics circuits.
- Ability to reform the shape of the metals
- Ability to understand the mechanism of bicycle, pumps, bearing, pulley and Jack