STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 1ST SEMESTER (Common to All ENGINEERING Programme) (W.e.f 2024-25)

Sl. No	Code No.	Course Title	Hours per week		Total contact hrs/ week	Credits	Evaluation Scheme			
			L	P			Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
1	TH 1(a) TH 1(b)	Communication Skills in English Or Introduction to IT Systems	3	-	3	3	30	70	3	100
2	TH 2	Applied Physics-I	4	-	4	4	30	70	3	100
3	TH 3	Mathematics-I	4	-	4	4	30	70	3	100
4	TH 4(a) TH 4(b)	Fundamentals of Electrical & Electronics Engineering Or Engineering Mechanics	4	-	4	4	30	70	3	100
5	TH 5	Environmental Science	4	-	4	4	30	70	3	100
		TOTAL	**19**	**-**	**19**	**19**	**150**	**350**	**---**	**500**
6	PR 1(a) PR 1(b)	Communication Skills in English Lab OR Introduction to IT Systems Lab	-	4	4	2	25	---	---	25
7	PR 2	Applied Physics-I Lab	-	2	2	1	25	25	3	50
8	PR 3(a) PR 3(b)	Engineering Graphics OR Engineering Workshop Practice	-	4	4	2	25	75	4	100
9	PR 4(a) PR 4(b)	Fundamentals of Electrical & Electronics Engineering Lab Or Engineering Mechanics Lab	-	2	2	1	25	---	----	25
10	PR 5	Sports and Yoga	-	2	2	1	50	--	--	50
			-	14	14	7	150	100		
		TOTAL	**19**	**14**	**33**	**26**	**300**	**450**	**---**	**750**

Abbreviations: L-Lecturer, P-Practical. Each class is of 1 Hour duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

There shall be Induction Program before beginning of 1st Semester and Internships at the end of 2nd Semester Classes as per AICTE norm. The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this ,Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 2nd SEMESTER (Common to All ENGINEERING Programme) (W.e.f 2024-25)

Sl. No	Code No.	Course Title	Hours per week		Total contact hrs/ week	Credits	Evaluation Scheme			
			L	P			Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
1	TH 1(a) TH 1(b)	Communication Skills in English Or Introduction to IT Systems	3	-	3	3	30	70	3	100
2	TH 2	Applied Physics-II	4	-	4	4	30	70	3	100
3	TH 3	Mathematics-II	4	-	4	4	30	70	3	100
4	TH 4(a) TH 4(b)	Fundamentals of Electrical & Electronics Engineering Or Engineering Mechanics	4	-	4	4	30	70	3	100
5	TH 5	Applied Chemistry	4	-	4	4	30	70	3	100
		TOTAL	**19**	**-**	**19**	**19**	**150**	**350**	**---**	**500**
6	PR 1(a) PR 1(b)	Communication Skills in English Lab OR Introduction to IT Systems Lab	-	4	4	2	25	---	---	25
7	PR 2	Applied Physics-II Lab	-	2	2	1	25	25	3	50
8	PR 3(a) PR 3(b)	Engineering Graphics OR Engineering Workshop Practice	-	4	4	2	25	75	4	100
9	PR 4(a) PR 4(b)	Fundamentals of Electrical & Electronics Engineering Lab Or Engineering Mechanics Lab	-	2	2	1	25	---	----	25
10	PR 5	Applied Chemistry Lab	-	2	2	1	25	25	3	50
			-	14	14	7	125	125		
		TOTAL	**19**	**14**	**33**	**26**	**275**	**475**	**---**	**750**

Abbreviations: L-Lecturer, P-Practical. Each class is of 1 Hour duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

There shall be Induction Program before beginning of 1st Semester and Internships at the end of 2nd Semester Classes as per AICTE norm. The best of 2 IA conducted in a subject out of 20 marks to be considered. Assignment/ quiz etc. of 10 marks to be treated as part of IA. Besides this ,Monthly Test to be conducted for each subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester. Club/Innovation/ Idea Tinkering Activities etc. shall be encouraged to be performed by students beyond the above stipulated hours.

Communication Skills in English(Revised)

Course Code- TH 1(a) (Common to 1st& 2nd Sem)

Period per week:	03	IA:	30 Marks
Total Period:	45	End Sem:	70 Marks
Timing of End Exam:	03 Hours	No of Credit:	03

Course outcomes:

At the end of this course, the students will be able to:

•Understand the meaning, process of communication, types of communication and barrier in communication and manner to communicate effectively.

•Comprehend soft skill and hard skill and to apply it in day to day life.

•Comprehend the seen passages and develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.

•Write personnel & business letter and drafting of notice and minutes of a meeting.

• Enhancement of vocabulary and apply English grammar rules correctly while framing a sentence, answer and writing letter, application etc and enhancement of vocabulary

Course Content

Unit-1 Communication: Theory and Practice (8 Hours)

- Basics of communication: Introduction, meaning and definition, process of communication
- Types of communication: formal and informal, verbal, non-verbal and barriers to effective communication
- **7** Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous)
- Art of Effective communication
  - Choosing words
  - Voice
  - Modulation
  - Clarity
  - Time
  - Simplification of words
- Technical Communication

Unit-2 Soft Skills for Professional Excellence (5 Hours)

- Introduction: Soft Skills and Hard Skills
- Importance of Soft Skills
- Life Skills: Self-awareness and Self-analysis
- Applying Soft Skills across cultures

Unit-3: Reading Comprehension (12 hours)

Comprehension, vocabulary enhancement and grammar exercises based on reading of the following texts:

Section-1

- "An Astrologer's Day", "The Missing Mail", " Doctor's Word" by R.K. Narayan (*Malgudi Days*)
- "The Gift of the Magi" by O.Henry

Section-2

- "Stopping by Woods on a Snowy Evening" by Robert Frost,
- "Where the Mind is Without Fear" by Rabindranath Tagore

Unit-4: Professional Writing (10 hours)

- Summary writing and Report writing
- Letters: Business and Personal
- Drafting e-mail, notices, Minutes of a Meeting
- Filling-up different forms such as banks and on-line forms for placement

Unit-5: Vocabulary and Grammar (10 hours)

- Vocabulary of commonly used words
- Commonly used administrative terms (English only), One-word substitution, Parts of Speech, Active and Passive voice, Tenses , Punctuation

References:

1. M. Ashraf Rizvi. *Effective Technical Communication*. Mc-Graw Hill, 2002.
2. John Nielson. *Effective Communication Skills*. Xlibris, 2008.
3. *Roget's Thesaurus of English Words and Phrases*
6. Wren & Martin. *High School English Grammar and Composition*. S Chand,2024
7. A. J. Thomson & A. V. Martinet. *Practical English grammar*.Oxford University Press,1997
8. R.K.Narayan.*Malgudi Days*. Indian Thought Publications,2017
9. Sanjay.Kumar&Pushp.Lata. *Communication Skills*. Oxford University Press,2024

Introduction to IT Systems

Course Code- TH 1(b)

(Common to 1st & 2nd sem)

Period per week:	3	IA:	30 Marks
Total Period:	45	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	3

Course outcomes:

At the end of the course, students will be able to:

- ✓ Develop the skill to handle & operate computer and access the internet.
- ✓ Assemble the PC, install & configure OS and other software/Hardware.
- ✓ Design & develop the website using mark up language.
- ✓ Create and work with various office tools.
- ✓ Enhance the skill to protect the system and its information from cyber attacks.

Course Content:

UNIT 1:

Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital
India portals (state and national portals) and college portals.

General understanding of various computer hardware components – CPU, Memory, Display, Key- board, Mouse, HDD and other Peripheral Devices.

UNIT 2:

OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

UNIT 3:

HTML4, CSS, making basic personal webpage.

UNIT 4:

Office Tools: OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress.

UNIT 5: Information security best practices.

Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. This course is all about some theory and a lot of practice.

References:

1. Introduction to IT Systems (English) by Prof. Prashant Joshi (Download from https://ekumbh.aicte-india.org/dbook.php)
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
4. Online Resources, Linux man pages, Wikipedia
5. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

Applied Physics –I
Course Code- TH 2
(Common to 1st Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome:

After completion of the course the students will be able to:

1) Classify different physical quantities and derive their units and dimensions.

2) Differentiate between scalar and vector quantity and use its properties to understand physical laws & different types of motion .

3) Apply the basic concept of force, torque, work, energy, power, friction, Moment of Inertia to solve simple classical Mechanics problems.

4) Apply different laws of elasticity, hydro statics and hydro dynamics to calculate various mechanical properties of solid and fluids.

5) Analyze various modes of heat transfer and behaviour of matter under exposure of heat and select appropriate thermometer to measure various range of temperature in industrial application.

Course Content:

Unit 1: **Physical world, Units and Measurements**

Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units),

Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis.

Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit 2: Force and Motion

Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller.

Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its applications.

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear

acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

Unit 3: Work, Power and Energy

Work: Concept and units, examples of zero work, positive work and negative work

Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications.

Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, trans- formation of energy (examples).

Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: **Rotational Motion**

Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

Unit 5: **Properties of Matter**

Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve.

Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications.

Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension.

Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature
on viscosity, application in hydraulic systems.

Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications.

Unit 6: Heat and Thermometry

Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Co-efficient of thermal conductivity, engineering applications.

References:

1. Applied Physics-I (English) by Prof. Vinod Kumar Yadav (down load from https://ekumbh.aicte-india.org/dbook.php)
2. 'Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
3. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Engineering Physics by DK Bhhatacharya & PoonamTandan; Oxford University Press, New Delhi.
7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
8. Practical Physics by C. L. Arora, S. Chand Publication.
9. e-books/e-tools/ learning physics software/websites etc.

Mathematics- I

Course Code- TH 3

(Common to 1st Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcomes:

At end of the course, the students will be able to:

(i) Acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis of engineering problems.

(ii) Find the effects of changing conditions on a system in probability and calculus.

(iii) Apply Complex numbers to physical phenomena.

(iv) Decompose rational function to partial fraction for computing the anti-derivative of a function.

Course Content:

UNIT - I: Trigonometry

Concept of angles, measurement of angles in degrees, grades and radians and their conversions, T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

Graphs of sin x, cos x, tan x and e^x .

UNIT-II: Differential Calculus

Definition of function; Concept of limits. Four standard limits $\lim_{x \to a} \frac{x^n - a^n}{x-a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to a} \left(\frac{a^x - 1}{x}\right)$ and $\lim_{x \to a} (1+x)^{\frac{1}{x}}$

Differentiation by definition of x^n, $\sin x$ $\cos x$, $\tan x$, e^x and $\log_a x$. Differentiation of sum, product and quotient of functions. Differentiation of function of a function. Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Exponential functions.

UNIT - III: Algebra

Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a com- plex number, modulus and amplitude of a complex number Addition, Subtraction, Multiplication and Division of a complex number. De-movier's theorem, its application.

Partial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction.

Permutations and Combinations: Value of ${}^{n}P_{r}$ and ${}^{n}C_{r}$.

Binomial theorem: Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

References:

✓ Mathematics-I by Dr. Deepak Singh (Download from https://ekumbh.aicte-india.org/dbook.php)

✓ B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.

✓ G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.

✓ Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)

✓ V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.

✓ Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Fundamentals of Electrical & Electronics Engineering

Course Code- TH 4(a)

(Common to 1st & 2nd Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome-

At the end of this course, the students will be able to:

- ✓ Identify & analyze different types of electronics components and signals.
- ✓ Analyze basic op-amp circuits and digital circuits.
- ✓ Develop the concept on Electrical and magnetic circuit parameters.
- ✓ Acquire knowledge of Machines & Transformer.
- ✓ Develop knowledge on AC circuit & solve numericals.

Course Content:

UNIT I Overview of Electronic Components & Signals:

Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. (Concept and simple problems of Resistance, Capacitor & Inductor, Definition, classification and Working of diode(PN juction,LED, Zener), transistor, FET, Concept of MOS and CMOS)

Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources. (Definitions)

UNIT II Overview of Analog Circuits:

Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Application of Op-Amp as amplifier, adder, differentiator and integrator.

UNIT III Overview of Digital Electronics: Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach (Simple problems of Number system)

Storage elements-Flip Flops-A Functional block approach, Counters: Ripple, Up/down and decade, Introduction to digital IC Gates (of TTL Type).

Unit IV Electric and Magnetic Circuits:

EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

Unit V A.C. Circuits:

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.

Unit VI (Revised) Transformer and Machines: General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of DC motors; Basic equations and characteristic of motors.

References:

1. Fundamentals of Electrical and Electronics Engineering by Prof. Susan S. Mathew (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
3. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
4. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
5. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
6. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
7. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
8. Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 978-8121927833
9. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13**:** 0070634244-978
10. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
11. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, NewDelhi 2015 ISBN : 9780195425239

Engineering Mechanics

Course Code- TH 4(b)

(Common to 1st & 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	Term End Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course outcomes:

After completing this course, student will be able to:

1. Analyze the coplanar force system and find out the resultant force of this system by applying basics of mechanics.
2. Determine unknown forces of different engineering systems by applying laws of equilibrium.
3. Apply the principle of friction in various conditions when the object is in static equilibrium.
4. Find the centroid and centre of gravity of various components in engineering system.
5. Analyze different simple machines to find out different influencing parameters viz. Mechanical Advantage, Velocity Ratio and Efficiency.

Course Contents:

Unit – I Basics of mechanics and force system

Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics.

Space, time, mass, particle, flexible body and rigid body.

Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.

Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.

Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem.

Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium

Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analysing equilibrium

Lami's Theorem – statement and explanation, Application for various engineering problems.

Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple),

Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load.

Beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit– III Friction

Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction.

Equilibrium of bodies on level surface subjected to force parallel and inclined to plane.

Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Unit– IV Centroid and centre of gravity

Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle)

Centroid of composite figures composed of not more than three geometrical figures

Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere)
Centre of Gravity of composite solids composed of not more than two simple solids.

Unit – V Simple lifting machine

Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity
ratio, efficiency of machines, law of machine.

Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility

Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

Suggested Learning Resources:

1. Engineering Mechanics by Prof. Bhankhar Bharat Gokaldas (Download from https://ekumbh.aicte-india.org/dbook.php)
2. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
3. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
4. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
5. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
6. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
7. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cam- bridge University Press.
8. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Environmental Science

Course Code-TH 5(a)

(Common to 1st & 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course outcomes

At the end of the course student will be able to

1. Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco-friendly products.
2. Understand the suitable air, extent of noise pollution, and control measures and acts.
3. Understand the water and soil pollution, and control measures and acts.
4. Understand different renewable energy resources and efficient process of harvesting.
5. Understand solid Waste Management, ISO 14000 & Environmental Management

Course Content:

Unit-1 Ecosystem

Structure of ecosystem, Biotic & Abiotic components Food chain and food web

Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle.

Global warming -Causes, effects, process, Green House Effect, Ozone depletion

Unit– 2 Air and, Noise Pollution

Definition of pollution and pollutant, Natural and man made sources of air pollution (Refrigerants, I.C., Boiler)

Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)

Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler

Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

Unit- 3 Water and Soil Pollution

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).

Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

Unit– 4 Renewable sources of Energy

Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.

Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas.

Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy

Unit-5 Solid Waste Management, ISO 14000 & Environmental Management 06 hours

Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, bio-medical waste.

Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.

Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.

Air quality act 2004, air pollution control act 1981 and water pollution and control act1996.

Structure and role of Central and state pollution control board.

Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.

References:

(a) Suggested Learning Resources:

Books:

1. Environmental Science (English) by Dr. Subrat Roy (Download from https://ekumbh.aicte-india.org/dbook.php)
2. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07- 451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.

10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.

11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6

12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

13. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com)

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences.
- Encouraging students to visit to sites such as Railway station and research establishment around the institution.

Applied Chemistry

Course Code- TH 5(b)

(Common to 1st & 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome:

After completing this course, student will be able to:

1) Solve various engineering problems applying the basic knowledge of atomic, molecular, electronic modifications and Chemical bonding by analyzing the technology based on them.
2) Identify the problems associated with raw water used in drinking & boilers and sewage water and solve the problems by using different water treatment methods.
3) Analyze the properties engineering materials and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
4) Use relevant fuel and lubricants for domestic and industrial applications
5) To impart knowledge on the essential aspects of electrochemical cells, emf, applications of emf measurements and understand the Principles of corrosion and corrosion control.

- **Unit 1: Atomic Structure, Chemical Bonding and Solutions**

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H_2, F_2, HF hybridization in $BeCl_2$, BF_3, CH_4, NH_3, H_2O), coordination bond in NH_4^+, and anomalous properties of NH_3, H_2O due to hydrogen bonding, and metallic bonding.

Solution – idea of solute, solvent and solution, methods to express the concentration of solution molarity (*M* = mole per liter), ppm, mass percentage, volume percentage and mole frac tion.

- **Unit 2: Water**

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation.

I) Water softening techniques – soda lime process, zeolite process and ion exchange process.

II) Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

- **Unit 3: Engineering Materials**

  Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.

  Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

  General chemical composition, composition based applications (elementary idea only details omitted):

  Port land cement and hardening, Glasses Refractory and Composite materials.

  Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

- **Unit 4: Chemistry of Fuels and Lubricants**

  Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

  Proximate analysis of coal solid fuel

  petrol and diesel - fuel rating (octane and cetane numbers),

  Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

  Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical proper- ties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

- **Unit 5: Electro Chemistry**

  Electronic concept of oxidation, reduction and redox reactions.
  Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.
  Industrial Application of Electrolysis –
    - Electrometallurgy
    - Electroplating
    - Electrolytic refining.

  Application of redox reactions in electrochemical cells –
    - Primary cells – dry cell,
    - Secondary cell - commercially used lead storage battery, fuel and

  Solar cells. Introduction to Corrosion of metals –
    - definition, types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

  Internal corrosion preventive measures –
    - Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Suggested Sessional work:

- **Unit 1: Atomic Structure, Chemical Bonding and Solutions**

  Assignments: Writing electronic configuration of elements up to atomic number 30 (Z= 30). Numerical on molarity, ppm, mass percentage, volume percentage and mole fraction of given solution.

  Seminar: 1. Quantum numbers,

  2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic properties of metals.

  Projects: Model of molecules $BeCl_2$, BF_3, CH_4, NH_3, H_2O.

- **Unit 2: Water**

  Assignments: Simple problems on hardness calculation.

  Seminar: 1. Quality and quantity requirement of water in house and industry.

  2. Quality of control measures of effluents (BOD & COD).

  Projects: Collect water samples from different water sources and measure of hardness of water.

- **Unit 3: Engineering Materials**

  Assignments: Preparation of table showing different ores of iron, copper and aluminium metals along with their chemical compositions and classify in to oxide sulphide halide ores.

  Seminar: Discuss the chemical reactions taking place in blast furnace in extraction
  of Fe, Cu and Al metals.

  Projects: Make table showing place of availability of different ores in India and show places on India map.

- **Unit 4: Chemistry of Fuels and Lubricants**

  Assignments: Calculation of HCV and LCV of fuel using fuel composition in Dulong's formula.

  Seminar: Chemical structure of fuel components influence on fuel rating.

  Projects: Mapping of energy resources in India. Collection of data of various lubricants available in the market.

- **Unit 5: Electro Chemistry**

  Assignments: Simple problems on Faradays laws of electrolysis.

  Seminar: 1. Corrosion rate and units.
  2. Corrosion preventions.

  Projects: Mapping of area in India prone to corrosion. Collection of data of various electrochemical cells batteries used in equipment and devices and avail- able in market. Visit to sites such as Railway station to watch corrosion area in railways and research establishment in and around the institution.

References/Suggested Learning Resources:

(a) Books :

✓ Applied Chemistry by Dr. Anju Rawlley (Download from https://ekumbh.aicte-india.org/dbook.php)
✓ Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
✓ Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
✓ C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
✓ Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Del- hi, 2015.
✓ Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
✓ Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
✓ Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
✓ Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

(b) Open source software and website address:

1 www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2 www.visionlearning.com (Atomic structure and chemical bonding)
3 www.chem1.com (Atomic structure and chemical bonding)
4 https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5 www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6 www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
7 www.chemcollective.org (Metals, Alloys)
8 www.wqa.org(Water Treatment)

Communication Skills in English Lab(Revised)

Course Code- PR 1(a)

(Common to 1st& 2nd Sem)

Period per week:	04	Sessional	25 Marks
Total Period:	60	End Sem:	----
Timing of End Exam:	---	No of Credit:	02

COURSE OUTCOME:

After completion of the course the students will be able to:

1. Apply 4s i.e Listening, Speaking, Reading and Writing effectively in day to day life.
2. Use of correct pronunciation, intonation, stress, rhythm, speed and pause while communicating with others .
3. Comprehend the basic etiquette of interview, GD, Conversation and Presentation
4. Analyze a given topic and way to present it.
5. Build vocabulary and use in every day situation.

Course Content:

Unit 1 : Listening Skills (10 hours)

Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests

Unit II : Introduction to Phonetics (20 hours)

Sounds: Consonant, Vowel, Diphthongs, Transcription of Words (IPA), weak forms, syllable division, word stress, intonation, voice

Unit III : Speaking Skills (30 hours)

Standard and formal speech: Group Discussion, Oral Presentations, Public Speaking, Business Presentations, Conversation practice and Role play

Recommended Readings:

1. Bansal And Harrison. *Spoken English*. Orient Black Swan, 2011.
2. James Hartman & et al. Ed. *English Pronouncing Dictionary.* Cambridge: Cambridge University Press, 2006.
3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Ed. 2018)
4. J.D.O'Connor. *Better English Pronunciation.* Cambridge: Cambridge University Press, 1980.
5. Lindley Murray. *An English Grammar: Comprehending Principles and Rules.* London: Wilson and Sons, 1908.
6. Margaret M. Maison. *Examine your English.* Orient Longman: New Delhi, 1964.
7. J.Sethi & et al. *A Practice Course in English Pronunciation*. New Delhi: Prentice Hall, 2004.
8. Pfeiffer, William Sanborn and T.V.S Padmaja. *Technical Communication: A Practical Approach*. 6th edn. Delhi: Pearson, 2007.

8. Pfeiffer, William Sanborn and T.V.S Padmaja. *Technical Communication: A Practical Approach*. 6th ed. Delhi: Pearson, 2007.

Introduction to IT System Lab

Course Code- PR 1(b)

(Common to 1st & 2nd sem)

Period per week:	4	Sessional:	25 Marks
Total Period:	60	End Sem Exam:	---
Timing of End Exam:	---	No. Of Credit:	2

Course outcomes:

At the end of the course students will be able to:

1) Analyze the components of computer hardware such as ports, interfaces, cables etc. and assemble them.
2) Install & configure Linux/Windows Operating System and explore the security features/tools of OS.
3) Create & work with various Office Tools.
4) Apply the knowledge to access browsers, search engines, Web Pages and understand the features of government sites/portals by accessing the services offered by them.
5) Design & Develop the Web Pages by using mark-up language /scripts.

Course Content:

S.No.	Topics for Practice
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services offered
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times.
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML commands, try them with various values, make your own Webpage
7	Explore features of Open Office tools, create documents using these features, do it multiple times.
8	Explore security features of Operating Systems and Tools, try using them and see what happens.

This is a skill course. More you practice, better it will be.

References:

1) Introduction to IT Systems (English) by Prof. Prashant Joshi (Download from https://ekumbh.aicte-india.org/dbook.php)
2) Online resources, Linux man pages, Wikipedia.
3) R.S. Salaria, Computer Fundamentals, Khanna Publishing House.

4) Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
5) Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.
6) IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
7) PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

Applied Physics-I Lab

Course Code- PR 2

(Common to 1st sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	25 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	1

List of Practical's/Activities (To perform minimum 8 practicals).

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.
5. To find the co-efficient of friction between wood and glass using a horizontal board.
6. To determine force constant of a spring using Hook's Law.
7. To verify law of conservation of mechanical energy (PE to KE).
8. To find the moment of inertia of a flywheel.
9. To find the viscosity of a given liquid (Glycerin) by Stoke's law.
10. To find the coefficient of linear expansion of the material of a rod.
11. To determine atmospheric pressure at a place using Fortin's barometer.
12. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

SUGGESTED STUDENT ACTIVITES & STRATEGIES

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course

a. Make survey of different physical products and compare the following points
   - Measurements of dimensions
   - Properties
   - Applications
b. Library survey regarding engineering materials/products used in different industries
c. Seminar on any relevant topic.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences.

References:

1. Applied Physics-I (English) by Prof. Vinod Kumar Yadav (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
3. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P)Ltd.,
4. Practical Physics by C. L. Arora, S. Chand Publication.
5. e-books/e-tools/ learning physics software/YouTube videos/websites etc.

Engineering Graphics

Course Code- PR 3(a)

(Common to 1st & 2nd sem)

Period per week:	4	Sessional:	25 Marks
Total Period:	60	End Sem Exam	75 Marks
Timing of End Exam:	4 Hours	No. Of Credit	2

Course Outcomes

At the end of this course, the students will be able to:

1) Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing
2) Draw views of given object and components
3) Sketch orthographic projections into isometric projections and vice versa.
4) Apply computer aided drafting tools to create 2D engineering drawings

Course Content

Unit – I Basic elements of Drawing

Drawing Instruments and supporting materials: method to use them with applications.
Convention of lines and their applications.
Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale.

Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.

Geometrical and Tangency constructions. (Redraw the figure)

Unit – II Orthographic projections

Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination).

Introduction to orthographic projection, First angle and Third angle method, their symbols.

Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)

Unit – III Isometric Projections

Introduction to isometric projections. Isometric scale and Natural scale.

Isometric view and isometric projection.

Illustrative problems related to objects containing lines, circles and arcs shape only.

Conversion of orthographic views into isometric view/projection.

Unit – IV Free Hand Sketches of engineering elements

Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washer, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)

Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)

Unit – V Computer aided drafting interface

Computer Aided Drafting: concept.

Hardware and various CAD software available.

System requirements and Understanding the interface.

Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, status bar, drawing area, UCS icon.

File features: New file, Saving the file, Opening an existing drawing file, Creating templates, Quit.

Setting up new drawing: Units, Limits, Grid, Snap. Undoing and redoing action.

Unit – VI Computer aided drafting

Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, PolyLine.

Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.

Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers.

Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions.

Dim scale variable.

Editing dimensions.

Text: Single line Text, Multiline text.

Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.

S. No.	Practical Exercises	Unit No.
1	Draw horizontal, Vertical, 30 degree, 45 degree, 60 and 75 degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book)	I
2	Write alphabets and numerical (Vertical only) (do this exercise in sketch book)	I
3	Draw regular geometric constructions and redraw the given figure (do this exercise in sketch book) Part I	II
4	Draw regular geometric construction and redraw the given figure (do this exercise in sketch book) Part II	II
5	Draw a problem on orthographic projections using first angle method of projection having plain surfaces and slanting. Part I	III
6	Draw another problem on orthographic projections using first angle method of projection having slanting surfaces with slots. Part II	III
7	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs. Part I	III
8	Draw two problems on Isometric view of simple objects having plain and slant- ing surface by using natural scale. Part I	IV
9	Draw some problems on Isometric projection of simple objects having cylindrical surface by using isometric scale. Part I	IV
10	Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part I	V

11	Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book. Part I	III, II, V
12	Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD (Print out should be a part of progressive assessment). Part I	V
13	Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printout should be a part of progressive assessment). Part II	V
14	Draw basic 2D entities like: Circular and rectangular array using AutoCAD (Printout should be a part of progressive assessment). Part III	V
15	Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, circular and rectangular array, blocks using AutoCAD (Print out should be a part of progressive assessment). Part IV	V
16	Draw basic branch specific components in 2D using AutoCAD (Print out should be a part of term work). Part I	VI
17	Draw complex branch specific components in 2D using AutoCAD (Print should be a part of progressive assessment). Part I	VI

SUGGESTED LEARNING RESOURCES

1. Engineering Graphics (English) by Dr. Sharad K. Pradhan (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
3. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93- 80358-17-8.
4. Jain & Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
5. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07- 064837-1
6. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
7. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
8. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Pri- vate Limited-New Delhi (2010); ISBN: 978-8120337831.
9. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing HousePvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
10. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.
11. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

Software/Learning Websites

1. https://www.youtube.com/watch?v=TJ4jGyD-WCw
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. https://www.youtube.com/watch?v=_MQScnLXL0M
4. https://www.youtube.com/watch?v=3WXPanCq9LI
5. https://www.youtube.com/watch?v=fvjk7PlxAuo
6. http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf
7. https://www.machinedesignonline.com

Engineering Workshop Practice

Course Code- PR 3(b)

(Common to 1st & 2nd sem)

Period per week:	4	Sessional:	25 Marks
Total Period:	60	End Sem Exam:	75 Marks
Timing of End Exam:	4 Hours	No. Of Credit:	2

Course outcomes

At the end of the course, the student will be able to:

✓ Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines.

✓ Understand job drawing and complete jobs as per specifications in allotted time.

✓ Inspect the job for the desired dimensions and shape.

✓ Operate, control different machines and equipment's adopting safety practices.

Course Content:

S.No.	Details Of Practical Content
I	**Carpentry:** i) Demonstration of different wood working tools / machines. ii) Demonstration of different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc. iii) One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.
II	**Fitting:** i) Demonstration of different fitting tools and drilling machines and power tools ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc
III	**Welding:** i) Demonstration of different welding tools / machines. ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint
IV	**Sheet Metal Working:** i) Demonstration of different sheet metal tools / machines. ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. iii) One simple job involving sheet metal operations and soldering and riveting.
V	**Electrical House Wiring:** Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring, (ii) Lamp circuits- connection of lamp and socket by separate switches, (iii) Connection of Fluorescent lamp/tube light, (iv) simple lamp circuits-in- stall bedroom lighting. And (v) Simple lamp circuits- install stair case wiring.
VI	**Demonstration:** i) Demonstration of measurement of Current, Voltage, Power and Energy. ii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and accessories. iii) Tools for Cutting and drilling

References:

1. Engineering Workshop Practice (English) by Dr. A. K. Sarathe (Download from https://ekumbh.aicte-india.org/dbook.php)
2. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
3. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
4. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
5. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York

Fundamental of Electrical & Electronics Engineering Lab(*Revised*)

Course Code-PR4(a)

(Common to1st & 2nd Sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	---
Timing of End Exam:	---	No.of Credit:	1

Course Outcomes:

After completion of the course the students will be able to:

1. Classify different type of magnetic material by calculating permeability using B-H curve.
2. Calculate voltage, current and power in 1-phase and 3-phase circuit by connecting different load (R, R-L, R-C)
3. Determine the transformation ratio(K) other parameters of single phase transformer.
4. Distinguish various electronic components and measure values using multimeter,
5. Draw the input and output characteristics of transistor and Diodes and identify the region of operation.

Suggested Practicals/Exercises:

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

Sl.No.	List of the Practical
1.	Determine the permeability of magnetic material by plotting its B-H curve
2.	Measure voltage, current and power in 1-phase circuit with resistive load
3.	Measure voltage, current and power in R-L series circuit
4.	Determine the transformation ratio(K) of 1-phase transformer
5.	Connect single phase transformer and measure input and output quantities
6.	Make Star and Delta connection in starter to run induction motor
7.	Identify various passive and active electronics components
8.	Connect resistors in series and parallel combination and measure its value using digital multimeter
9.	Connect capacitors in series and parallel combination and measure its value using multimeter
10.	Use multimeter to measure the value of given resistor and determine the value to confirm with colour code
11.	Test the PN-junction diode and LED using digital multimeter
12.	Test the performance of PN-junction diode
13.	Test the performance of Zener diode
14.	Identify three terminals of a transistor using digital multimeter
15.	Test the performance of NPN transistor

Engineering Mechanics Lab

Course Code- PR 4(b)

(Common to 1st & 2nd sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	---
Timing of End Exam:	---	No. Of Credit:	1

Course outcomes:

After completion of the course the students will be able to:

1. Analyze different simple machines to find out different influencing parameters viz. Mechanical Advantage, Velocity Ratio and Efficiency.
2. Understand the phenomena of friction in different condition and make analysis through experiment to find out coefficient of friction.
3. Determine resultant of various force systems and analyse the equilibrium of a rigid body by Lamis theorem.
4. Analyse and find out the value of support reactions of different types of beam.
5. Determine Centroid of geometrical plane figures.

List of Practical to be performed:

1. To study various equipments related to Engineering Mechanics.
2. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
3. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
4. Derive Law of machine using Worm and worm wheel.
5. Derive Law of machine using Single purchase crab.
6. Derive Law of machine using double purchase crab.
7. Derive Law of machine using Weston's differential or wormed geared pulley block.
8. Determine resultant of concurrent force system applying Law of Polygon of forces using force table.
9. Determine resultant of concurrent force system graphically.
10. Determine resultant of parallel force system graphically.
11. Verify Lami's theorem.
12. Study forces in various members of Jib crane.
13. Determine support reactions for simply supported beam.
14. Obtain support reactions of beam using graphical method.
15. Determine coefficient of friction for motion on horizontal and inclined plane.
16. Determine centroid of geometrical plane figures.

Suggested Learning Resources:

1. Engineering Mechanics by Prof. Bhankhar Bharat Gokaldas (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Bedi D.S., Engineering Mechanics, Khanna Publishing House
3. Khurmi, R.S., Applied Mechanics, S.Chand & Co. New Delhi.
4. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
5. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. New Delhi.
6. Dhade, Jamadar & Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.
7. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge Uni- versity Press.
8. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

Sports and Yoga (*Revised*)

Course Code- PR 5(a)
(Common to 1st & 2nd Sem)

Period per week:	2	Sessional:	50 Marks
Total Period:	30	End Sem Exam:	-------
		No. Of Credit:	1

Course Outcomes:

On successful completion of the course the students will be able to:

(i) Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.

(ii) Learn breathing exercises and healthy fitness activities

(iii) Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.

(iv) Perform yoga movements in various combination and forms.

(v) Identify opportunities for participation in yoga and sports activities.

(vi) Improve personal fitness through participation in sports and yogic activities.

(vii) Assess yoga activities in terms of fitness value.

Course Content:

- **Physical Fitness, Wellness & Lifestyle**
  - Meaning & Importance of Physical Fitness & Wellness
  - Components of Physical fitness
  - Components of Health related fitness
  - Components of wellness
  - Preventing Health Threats through Lifestyle Change
  - Concept of Positive Lifestyle
- **Postures**
  - Meaning and Concept of Postures.
  - Causes of Bad Posture.
  - Concept & advantages of Correct Posture.
- **Yoga**
  - Meaning & Importance of Yoga
  - Elements of Yoga
  - Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
  - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
  - Relaxation Techniques for improving concentration - Yog-nidra

- **Yoga & Lifestyle**

  - Asanas as preventive measures.

  - Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Shavasana.

  - Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.

  - Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.

  - Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.

  - Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

- **Training and Planning in Sports**

  - Meaning of Training
  - Warming up and limbering down
  - Skill, Technique & Style
  - Meaning and Objectives of Planning.
  - Tournament – Knock-Out, League/Round Robin & Combination.

- **Sports Medicine**

  - First Aid – Definition, Aims & Objectives.
  - Sports injuries: Classification, Causes & Prevention.
  - Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

- **Sports / Games**

  Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

  - History of the Game/Sport.
  - Latest General Rules of the Game/Sport.
  - Specifications of Play Fields and Related Sports Equipment.
  - Important Tournaments and Venues.
  - Sports Personalities.
  - Proper Sports Gear and its Importance.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light on Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Applied Chemistry Lab

Course Code- TH 5(b)

(Common to 1st & 2nd sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	25 Marks
Timing of End Exam:	3 Hours	No. Of Credit	1

Course Outcome:

After completion of the course the students will be able to:

1) Explain various methods of volumetric analysis i.e. Redox, Iodometric, complexometric, Neutralization etc. and use of conductivity meter for measurement of conductance of water sample.

2) Apply the use of internal and external indicators and their comparison for redox titrations and mechanisms of iodometric titrations and use of double indicator method in a single titration.

3) Estimate the % values of moisture, volatile matter, ash and carbon of fuel by Proximate analysis and instrument handling.

4) Analyse the properties of lubricants viz. Flash & fire point, viscosity, cloud & pour point and their significance.

LIST OF PRACTICALS:

Perform any 10 (Ten) Laboratory Practicals.

Volumetric and Gravimetric analysis:

1 Preparation of standard solution of oxalic acid or potassium permanganate.

2 To determine strength of given sodium hydroxide solution by titrating against standard oxalic
acid solution using phenolphthalein indicator.

3 Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of
iron present in given Hematite ore by $KMnO_4$ solution.

4 Iodometric estimation of copper in the copper pyrite ore.

5 Volumetric estimation of total acid number (TAN) of given oil.

6 Volumetric estimation of

a) Total hardness of given water sample using standard EDTA solution.

b) Alkalinity of given water sample using 0.01M sulphuric acid

7 Proximate analysis of coal

a) Gravimetric estimation moisture in given coal sample

b) Gravimetric estimation ash in given coal sample

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.

12. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
13. To verify the first law of electrolysis of copper sulfate using copper electrode.
14. Construction and measurement of emf of elector chemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit to sites such as Railway station and research establishment around the institution.

Reference Books:

✓ Applied Chemistry by Dr. Anju Rawlley (Download from https://ekumbh.aicte-india.org/dbook.php)
✓ Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
✓ Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
✓ Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
✓ Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.

Applied Physics-II

Course Code- TH 2

(Common to 2nd Sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcome:

After completion of course the student will be able to:

1) Explain various parameters of longitudinal & transverse wave motion, derive expression for various parameters of SHM and explain methods of control of sound wave for acoustics of building and uses of ultrasonic wave in various medical and Engineering application.
2) Explain basic optical laws , various optical phenomena and uses of optical instruments.
3) Apply the fundamental electrostatic laws to calculate electric field intensity, electric potential & potential difference of straight charged conductor.
4) Classify magnetic materials (Dia, Para, Ferro) & calculate magnetic field intensity, Magnetic force produced by current carrying conductor.
5) Distinguish solid materials based on conductivity & Energy band gap and explain various engineering and medical application of LASERs, Fiber optics and Nano Technology.

Course Content

UNIT - 1: Wave motion and its applications

Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties, wave equation ($y = r \sin \omega t$) amplitude, phase, phase difference, principle of superposition of waves and beat formation.

Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Simple harmonic progressive wave and energy transfer, study of vibration of cantilever and determination of its time period, Free, forced and resonant vibrations with examples.

Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

UNIT - 2: Optics

Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber.

Optical Instruments; simple and compound microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, uses of microscope and telescope, optical projection systems.

UNIT - 3: Electrostatics

Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.

UNIT - 4: Current Electricity

Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding.

Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electromotive force (EMF)

Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.

UNIT - 5: Electromagnetism

Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization.

Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field.

Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.

UNIT - 6: Semiconductor Physics

Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped).

Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only).

Photocells, Solar cells; working principle and engineering applications.

UNIT - 7: Modern Physics

Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers.

Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors.

Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, nanotechnology based devices and applications.

References:

1. Applied Physics-I by Prof. Vinod Kumar Yadav (Download from https://ekumbh.aicte-india.org/dbook.php)
2. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
3. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi.
6. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
7. A Textbook of Optics, N Subramanyam, Brij Lal, MN Avahanulu, S Chand and Company Ltd.
8. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University Press India Pvt. Ltd, New Delhi.
9. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
10. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.
11. e-books/e-tools/ learning physics software/websites etc.

Mathematics- II

Course Code- TH 3

(Common to 2nd sem)

Period per week:	4	IA:	30 Marks
Total Period:	60	End Sem Exam:	70 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	4

Course Outcomes:

At the end of the course, the students will be able to:

(i) Apply the concept of Determinants and Matrices on 3rd order system of equations to find the unknown parameters and simple programming using MATLAB.

(ii) Apply Integral calculus to obtain area and volume of solid.

(iii) Connect algebra and geometry through graphs of lines and curves.

(iv) Differentiate between a resultant and a concurrent force through vector algebra.

(v) To model simple physical problems in the form of a differential equation, analyze and interpret its solutions.

Course Content:

UNIT - I: Determinants and Matrices

Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.

UNIT - II: Integral Calculus

Integration as inverse operation of differentiation. Simple integration by substitution, by parts and by partial fractions (for linear factors only). Use of formulas $\int_0^{\frac{\pi}{2}} \sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\, dx$ and $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\, dx$ for solving problems Where m and n are positive integers.

Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).

UNIT - III: Co-Ordinate Geometry

Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula.

General equation of a circle and its characteristics. To find the equation of a circle, given:

ii. Centre and radius,

iii. Three points lying on it and

iv. Coordinates of end points of a diameter;

Definition of conics (Parabola, Ellipse, Hyperbola) their standard equations without proof. Problems on conics when their foci, directories or vertices are given.

UNIT - IV: Vector Algebra

Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar
and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.

UNIT-V: Differential Equations

Solution of first order and first degree differential equation by variable separation method (simple
problems). MATLAB – Simple Introduction.

References:

- ✓ Mathematics-II by Dr. Garima Singh (Download from https://ekumbh.aicte-india.org/dbook.php)
- ✓ B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
- ✓ G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
- ✓ S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.
- ✓ Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.
- ✓ Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

Applied Physics-II Lab

Course Code-PR 2

(Common to 2nd sem)

Period per week:	2	Sessional:	25 Marks
Total Period:	30	End Sem Exam:	25 Marks
Timing of End Exam:	3 Hours	No. Of Credit:	1

Course Outcome:

List of Practicals/Activities: (To perform minimum 10 Practicals)

1. To determine and verify the time period of a cantilever.
2. To determine velocity of ultrasonic in different liquids using ultrasonic interferometer.
3. To verify laws of reflection from a plane mirror/ interface.
4. To verify laws of refraction (Snell's law) using a glass slab.
5. To determine focal length and magnifying power of a convex lens.
6. To verify Ohm's law by plotting graph between current and potential difference.
7. To verify laws of resistances in series and parallel combination.
8. To find the frequency of AC main using electrical vibrator.
9. To verify Kirchhoff's law using electric circuits.
10. To study the dependence of capacitance of a parallel plate capacitor on various factors and determines permittivity of air at a place.
11. To find resistance of a galvanometer by half deflection method.
12. To convert a galvanometer into an ammeter.
13. To convert a galvanometer into a voltmeter.
14. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee volt- age.
15. To verify inverse square law of radiations using a photo-electric cell.
16. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
17. To measure numerical aperture (NA) of an optical fiber.
18. Study of an optical projection system (OHP/LCD) - project report.

Suggested Student Activities & Strategies

Apart from classroom and laboratory learning following are the suggested student related activities which can be undertaken to accelerate the attainment of various outcomes of the course.

a. Make survey of different physical products and compare the following points
   - Measurements of dimensions
   - Properties
   - Applications
b. Library survey regarding engineering materials/products used in different industries
c. Seminar on any relevant topic.

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.

- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations/projects.
- Micro-projects on relevant may be given to group of students for hand-on experiences.

Recommended Books:

1. Applied Physics-I by Prof. Vinod Kumar Yadav (Download from https://ekumbh.aicte-india.org/dbook.php)
1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
3. Practical Physics by C. L. Arora, S. Chand & Company Ltd.
4. e-books/e-tools/ learning physics software/you Tube videos/ websites etc.