Jharkhand University of Technology, Ranchi

Diploma First Year

Branch: Automobile Engg. / Electrical Engg. / Electrical & EC Engg / Food Technology / Mechanical Engg. / Computer Engg. / ECE / Computer Sc. & Engg / Civil Engineering / Information Tech./ Metallurgical Engg. / Mining Engg. / Drilling Technology/ Computer Engg. Applications / MEA/ CS & IT / AAA (All Branches)

Semester: I

Session: 2023-2024

Jharkhand University of Technology, Ranchi

Diploma First Year

Branch: Automobile Engg. / Electrical Engg. / Electrical & EC Engg / Food Technology / Mechanical Engg. / Computer Engg. / ECE / Computer Sc. & Engg / Civil Engineering / Information Tech./ Metallurgical Engg. / Mining Engg. / Drilling Technology/ Computer Engg. Applications / MEA/ CS & IT / AAA

S. No.	Course Code	Course Title		L	T	P	J*	Cr	Categorisation
01	AEC01	Basic Mathematics		3	1	0		4	AEC
02	DSC01	Basic Science	Physics	2	0	2		5	DSC
			Chemistry	2		2			
03	AEC02	Communication Skills		1	0	2		2	AEC
04	DSC02	Engineering Graphics		2	0	3	6	3	DSC
05	SEC01	Engineering Workshop		0	0	3		1	SEC
06	SEC02	Fundamentals of ICT		1	0	2		2	SEC
07	VEC01	Yoga and Meditation/Sports/NSS/NCC/Classical Music/Painting etc.		0	0	3		1	VEC
Total				11	01	17	06	18	

Course Category: Ability Enhancement Course (AEC): 02, Discipline Specific Course Core (DSC): 02, Discipline Specific Elective (DSE): 0, Value Education Course (VEC): 01, Intern./Apprentice./Project./Community (INP): 0, Skill Enhancement Course (SEC): 02, Generic Elective (GE): 0

J*: This will include group discussion (GD), Seminar, Personal Interview Preparation, Workshop, Soft Skills Developments among the students

1. (One faculty from concerned department and other faculty either from HSS or training placement cell will be assigned to make the students ready for the industry.
2. Institution should also conduct some interactive session with Domain experts from the Industries/Academia/HR head of different organization.

Basic Mathematics

Rationale:

Mathematics provides foundation for all engineering subjects. Deep thought is given while selecting topics of this subject known as "Basic Mathematics" which intends to teach students basic facts, concepts and principles of mathematics as a tool to analyse engineering problems. It lays down the foundation for understanding core engineering and technology subjects.

Objective:

This subject helps the students to develop logical thinking, which is useful in comprehending the principles of all other subjects. Analytical and systematic approach towards any problem is developed through learning of this subject. Mathematics being a versatile subject can be used as a tool at every stage of human life.

Course Outcomes:

Students will be able to achieve & demonstrate the following:
1. Apply the concepts of algebra to solve engineering (discipline) related problems.
2. Utilize trigonometry to solve branch specific engineering problems.
3. Solve area specific engineering problems under given conditions of straight lines.
4. Apply differential calculus to solve discipline specific problems.
5. Use techniques and methods of statistics to crack discipline specific problems.

Unit No.			Topic	Hrs.
1.			**ALGEBRA**	**15**
	1.1		Prerequisites: Revision of Arithmetic, Geometric and Harmonic Progressions, Formula of nth term and sum to n-terms of Arithmetic and Geometric Progressions. Expression of $\sum n$, $\sum n^2$, $\sum n^3$.	01
	1.2		Logarithm: Concept and laws of logarithm with simple problems.	02
	1.3		Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3x3, adjoint and inverse of matrices.	03
			Solution of simultaneous equations by matrix inversion method.	02
	1.4		Partial Fractions: Types of partial fraction based on nature of factors and related Problems.	02
	1.5		Binomial theorem: Definition of factorial notation, definition of permutation and combinations with formula (without proof). Derivation of simple identities and solution based on it. Binomial theorem for positive index. General term, Middle term, independent term and coefficient of x^n.	04
	1.6		Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics).	01
2.			**Trigonometry**	**10**
	2.1		Revision: Measurement of an angle (degree and radian). Relation between degree and radian. Trigonometrical ratios of $0^o, 30^0, 45^0, 60^0, 90^0$, $90^0 \pm \theta$, $180^0 \pm \theta$, $360^0 \pm \theta$. Fundamental identities.	01
	2.2		Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles, Factorization and De factorization formulae (Without proof).	06
	2.3		Inverse Trigonometric Ratios and related problems: Principle values and relation between trigonometric and inverse trigonometric ratios.	02

	2.4	Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India. Indian Trigonometry: Basic Indian Trigonometry-Introduction and Terminology (From Ancient Beginnings to Nilakantha). Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.	01
3.		**COORDINATE GEOMETRY**	**10**
	3.1	Revision: Concept of Cartesian and Polar coordinate System. Distance formula, Section formula, midpoint, centroid of triangle. Area of triangle and condition of collinearity.	03
	3.2	Straight Line: Straight line and slope of straight line. Angle between two lines, Condition of parallel and perpendicular lines. Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form. Perpendicular distance from a point on the line. Perpendicular distance between two parallel lines.	06
	3.3	Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).	01
4.		**Differential Calculus**	**15**
	4.1	Functions and Limits: Concept of function and simple examples. Concept of limits with examples.	03
	4.2	Derivatives: Rules of derivatives such as sum, Product, Quotient of functions.	01
	4.3	Derivatives: Derivative of composite functions (chain Rule), implicit and parametric functions.	03
	4.4	Derivatives of inverse, logarithmic and exponential functions.	03
	4.5	Applications of derivative: Second order derivative without examples, Equation of tangent and normal, Maxima and minima, Radius of curvature.	04
	4.6	Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.	01
5.		**Statistics**	**06**
	5.1	Range, coefficient of range of discrete and grouped data.	01
	5.2	Mean deviation and standard deviation from mean of grouped and ungrouped data.	03
	5.3	Variance and coefficient of variance. Comparison of two sets of observation.	02

Suggested Books / Learning Materials:

S. No.	Title	Authors	Publications
1	Mathematics: A Textbook for ClassXI Part I &II	National Council of Educational Research and Training	
2	Mathematics: A Textbook for ClassXII Part I &II	National Council of Educational Research and Training	
3	Mathematics for Class XI	R. D. Sharma	Dhanpat Rai Publication, New Delhi.

4	Mathematics for Class XII	R. D. Sharma	Dhanpat Rai Publication, New Delhi.
5	Higher Sr. Secondary School Mathematics for XI & XII	R.S. Agrawal	Bharti Bhawan, Patna
6	Higher Engineering Mathematics	B. S. Grewal	Khanna publication, New Delhi
7	Advance Engineering Mathematics	H. K. Das	S Chand publication, New Delhi
8.	A First Step to Differential Calculus	Dr Manoj Kumar	KDP, e-book https://amzn.eu/d/aqxvcip
9.	Web portal: https://www.ndl.gov.in/homestudy/science https://ncertbooks.ncert.gov.in/login https://epathshala.nic.in// https://webscte.co.in/ https://en.wikipedia.org/wiki/ https://openlibrary.org/ https://www.youtube.com/ http://content.inflibnet.ac.in/ https://doabooks.org/ https://www.oapen.org/home http://www.gutenberg.org/		
10.	Apps in Google Play Store:National Digital Library		
11.	e-Granthalaya NSDC eBook Reader: Kaushal ePustakalaya ePathshala		
12.	IGNOU e-content		

Basic Science

Course Objectives:
Physics is a branch of science which deals with nature and natural phenomena. Physics provides fundamental facts, principles, laws, and proper sequence of events to streamline Engineering knowledge. This course includes examples of industrial applications of physics principles in areas such as mechanics, electrical power generation and transmission, digital electronics and communication, and semiconductor technology. This course will help the Diploma Engineering students to apply the basic concepts and principles of physics for solving various engineering problems and to comprehend different technology based applications.

Chemistry is a basic science subject which is essential to all engineering courses. It gives knowledge of engineering materials, their properties, related applications & selection of materials for engineering applications. Due to technological progress there are hazardous effects on environment & human life. The core knowledge of environmental effects will bring awareness in students about the precautions & preventions to be taken to reduce the ill effects.This subject will generate curiosity of carrying out further development in engineering fields.

Course Outcomes:
Students will be able to achieve & demonstrate the following:
1. Estimate the errors in measurements of physical quantity with precision.
2. Apply the concept of waves for various engineering applications involving wave dynamics.
3. Apply the concepts of Hook's Law in engineering applications.
4. Use thermal conductivity in various thermal expansion related applications.
5. Apply the basic concepts of applications of Vernier calipers, Screw gauge for solving engineering problems.
6. Draw the orbital configuration of different elements, represent the formation of molecules schematically& predict the structure, properties and behaviour of molecules
7. Apply the concepts of electrochemistry and corrosion preventive measures in industry.
8. Use the appropriate engineering material and catalyst appropriately.
9. Identify the properties of non-metallic materials, related to engineering applications.
10. Compare the effects of pollutants on environments & to suggest preventivemeasures & safety.

Unit 1: Units and Measurements
Need of measurement and unit in Engineering and science. Fundamental and derived quantities and their units Systems of units: CGS, MKS and SI. Scalar and Vector Physical Quantities. Dimensions, dimensional formula, Applications of dimensional analysis; correctness of physical equations, conversion factor for inter conversion of units in different systems of units.
Errors, types of errors- instrumental, systematic and random error, estimation of errors: absolute, relative and percentage error, significant figures. Ancient astronomical instruments: Chakra, Dhanuyatra , Yasti and Phalaka yantra . Applications of Vernier calipers, Screw gauge. (Simple Problems)

Unit 2: Linear motion, force, Gravitation, Elasticity, Pressure
Derivation of equations of motion with uniform acceleration –
   i. $v = u + a t$,

      ii. $s = u t + \frac{1}{2} a t^2$

     iii. $v^2 = u^2 + 2 a s$

     iv. $S_n = u + \frac{1}{2} a (2n-1)$

Newton's laws of motion, force, inertia, momentum, impulse with practical examples, law of conservation of linear momentum. (Simple problems)

Newton's laws of gravitation, universal gravitational constant (G) and its S.I. unit , acceleration due to gravity (g) and its relation with 'G', variation of "g" with altitude and latitude. (Simple problems)

Deforming force, restoring force, elastic and plastic body, stress with their types, elastic limit, Hooke's law, Young's modulus, Bulk modulus, modulus of Rigidity and relation between them (no derivation, simple problems).

Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure.

Unit 3: Heat and Sound

Three modes of transmission of heat – conduction, convection and radiation with daily life examples, laws of thermal conductivity, coefficient of thermal conductivity and its S.I. unit. Definition of coefficients of linear, superficial and cubical expansion and relation between them (no derivation, simple problems).

Definition of wave motion, amplitude, period, frequency, and wavelength, Establish relation $v = n\lambda$, frequency and wavelength, longitudinal and transverse wave, definition of stationary wave, node and antinode (simple problems).

Unit 4: Atomic Structure

Indian Chemistry: - Philosophy of atom by Acharya Kanad. Definition of Atom, Fundamental Particles of Atom – their Mass, Charge, Location, Definition of Atomic no, Mass no., Isotopes & Isobars & their distinction with suitable examples, Bohr's Theory, Definition & Shape of the orbitals & distinction between Orbits & Orbitals, Hund's Rule, Aufbau's Principle, Pauli's exclusion principle, Electronic Configuration (till Atomic no. 30), Definition & types of Compounds e.g. $NaCl$, $CaCl_2$, MgO, $AlCl_3$, CO_2, H_2O, Cl_2, NH_3, C_2H_4, N_2, C_2H_2. Distinction between electrovalent & covalent compounds, Electronic theory of valency: Assumptions, Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, and metallic bond and Intermolecular forces of attraction.

Unit 5: Electrochemistry, Metal Corrosion & Its Prevention

Electrolytic dissociation, Arrhenius Theory of Ionization, Degree of Ionization & factors affectingdegree of ionization, Electrolyte - Types of electrolyte, ionization and dissociation, Cathode, Anode, Electrode potential: oxidation and reduction, Mechanism of electrolysis: Electrolysis, Electrochemical series for cations and anions. Electrolysis of $CuSO_4$ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaCl solution & fused NaCl by using carbon electrode, Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numerical. Applications of electrolysis: Electro-refining of copper and electroplating, Difference between Primary and Secondary cell.

Corrosion: Definition and Types of corrosion Dry corrosion: Mechanism, Types of oxide film, Wet corrosion: Mechanism hydrogen evolution in acidic medium, oxygen absorption in neutral or alkaline medium, Galvanic cell action by Daniel cell, Factors affecting the rate of corrosion. Corrosion control: Modification of environment, Use of protective coatings, coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing), Anodic and Cathodic protection, Choice of material- using pure metal and using metal Alloy.

Unit 6: Engineering Materials

Paints: Definition, Purposes of applying paint, Characteristics of paints, Ingredients of paints, Function and examples of each ingredient. Varnish: Types, Difference between paint and varnishes. Insulators: Characteristics, Classification, Properties and Application of Glass wool Thermocol, Asbestos. Polymer and monomer: Classification on the basis of Molecular structure, on the basis of monomers (homo polymer and copolymer),

on the basis of Thermal behavior (Thermoplastics and Thermosetting). Types of Polymerization Reaction, Addition Polymerization, Condensation Polymerization, Synthesis, properties and application of Polyethylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Epoxy Resin.
Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanization of Rubber with Chemical Reaction. Synthetic Rubber: Definition, Distinction between Natural & Synthetic rubber. Properties & applications of Vulcanized & Synthetic Rubber. Adhesives: Definition, Characteristics, Classification and their uses. Lubricants: Definition, Classification, properties and Applications.

Unit 7: Environmental Effects (awareness level)

Definition of Pollution & Pollutant, Causes of Pollution, Types of Pollution - Air & WaterPollution. Types of Air pollutants their Sources & Effects, such as Gases, Particulates, Radio, Active Gases, Control of Air Pollution, Air Pollution due to Internal Combustion Engine & Its Control Methods, Deforestation their effects & control measures. Cause, Effects & controlmeasures of Ozone Depletion & Green House Effect. Causes & Methods of Preventing WaterPollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical &Biological Characteristics, Concept & significance of BOD, COD, Biomedical Waste & E – Waste, their Origin, Effects & Control Measures, Preventive Environmental Management(PEM) Activities.

Laboratory Experiments / Practical

A judicial mix of minimum 16 practical need to be performed.

1. To use Vernier callipers for the measurement of dimensions of a given object.
2. To use a micrometer screw gauge for the measurement of dimensions (length, thickness, diameter) of a given object.
3. To use a spherometer for the measurement of thickness of a given glass piece.
4. To calculate Young's modulus of elasticity of a given wire by Vernier method/ Searle's method.
5. Determination of acceleration due to gravity using a simple pendulum.
6. To determine the velocity of sound by using a resonance tube.
7. To determine the refractive index of a glass using a glass slab by pin method (sin i / sin r= μ).
8. To calculate the coefficient of linear expansion for copper using Pullinger's apparatus.

9. Identification of any Four Cations in given ionic salt solutions.
   Basic Radicals: Pb^{+2}, Cu^{+2}, Al^{+3}, Fe^{+2}, Fe^{+3}, Cr^{+3}, Zn^{+2}, Ni^{+2}, Ca^{+2}, Ba^{+2}, Mg^{+2}, K^+, NH_4^+.

10. Identification of any Four Anions in given ionic salt solutions.
    Acidic radicals: Cl^-, Br^-, I^-, CO_3^{-2}, SO_4^{-2}, NO_3^-.

11. To standardize $KMnO_4$ using Sodium Oxalate.
12. To determine pH of given solution by Universal Indicator & pH meter.
13. To determine the strength of given HCl solution by NaOH solution using pH meter titration.
14. To prepare Phenol-Formaldehyde Resin (Bakelite).
15. To determine Neutralization point of Fatty Acid & NH_4OH & calculate strength & Normality of Fatty Acid.
16. To determine percentage of Fe in the given Mohr's salt solution.
17. Determination of thinner content in oil paint.
18. To determine the Equivalent Conductivity of preparation of $BaCl_2$ with H_2SO_4 by Titration Method using Conductivity Meter & also find the Normality & Strength of $BaCl_2$ solution.

Suggested Learning Materials / Books

1. A Textbook of Engineering Physics-1, Pankaj Kumar, Khanna Publishers, New Delhi; ISBN: 978-93-87394-73-5.

2. Concept of physics-I, H.C. Verma, Bharti Bhawan Publishers, ISBN: 8177091875, 978-8177091878.

3. Fundamentals of Physics, David Halliday, Robert Resnick and Jearl Walker.

4. Engineering Physics, R.K. Gaur and S. L. Gupta

5. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P)Ltd.,

6. Practical Physics by C. L. Arora, S. Chand Publication.

6. Narlikar J. V. ;Joshi , A. W.; Mathur , Anuradha ; et al, Physics Textbook Part I - Class XI, National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660

7. Narlikar J.V.;Joshi , A. W.; Ghatak A.K. et al, Physics Textbook Part II - Class XII, National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713

8. Jain and Jain, Engineering Chemistry, National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083

9. Dara S.S., Engineering Chemistry, National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660

10. Aryabhatta, The Surya Siddhanta, Baptist Mission press ,Calcutta

11. Steeramula Rajeswara Sarma, The Archaic And The Exotic : Studies In The History Of Indian Astronomical Instruments, Manohar Book Service, 2008 ISBN 10: 8173045712 / ISBN 13 : 9788173045714

12. Anju Rawlley,Devdatta V. Saraf, Applied Chemistry with Lab Manual, Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8

Communication Skills

Course Outcomes:

Students will be able to achieve & demonstrate the following:

1. Construct grammatically correct sentences in English.

2. Compose paragraphs and dialogues on given situations

3. Comprehend passages correctly.

4. Use contextual words in English appropriately

5. Deliver effective presentations in English using appropriate body language

Unit 1: Vocabulary

Phonetics: Vowels (12), Consonants (24), Diphthongs (8). Prefix & Suffix: Definition & Examples, List of common prefixes and suffixes. Synonyms & Antonyms: Vocabulary expansion, Context & Usage. Homophones: Identifying Homophones, Meaning & Context, Vocabulary Expansion. Collocations: Definition & identification, Types of collocations.

Unit 2: Paragraph and Dialogue Writing

Types of paragraphs: Technical, Descriptive, Narrative. Dialogue Writing: i Greetings ii. Development iii. Closing Sentence Phonetic

Unit 3: Comprehension (Seen and Unseen Passages)

Say No to Plastic bags, Interview of Dr. APJ Abdul Kalam, Maximum Achievements, Be Remarkable, Arunima Sinha: A Biography, Roses of Gratitude. Importance of Comprehension. Unseen Passages. Interpretation of passages in written and spoken form.

Unit 4: Communicative Language

Technical objects: i. Heading ii. Description of technical objects. Picture Description: i. Situational picture ii. Describe in your own words. Diary Entry: i. Date ii. Content iii. Name of the writer. Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination).

Unit 5: Presentation Skills

Dressing & Grooming: i. Dressing for the occasion ii. Proper grooming. Speech Writing: i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion. Power Point Presentation: i. Layout ii. Font size iii. Color combination. Kinesics: i. Facial expressions ii. Eye contact iii. Postures iv. Gestures.

Laboratory Experiments / Practical

Any 12 out of 16 practical are compulsory

1. Write 20 words using phonetic transcription.

2. Practice pronunciation as per IPA using language lab.

3. Formulate 20 words using Prefix and Suffix.

4. Construct sentences using 20 collocations.

5. Write two paragraphs of 75 words each.

6. Compose situational dialogues (Any Two).

7. Enact Role Plays as per situation and context.

8. Describe any three technical objects using correct grammar.

9. Narrate anecdotes of various situations in English.

10. Describe a given picture (Any Two).

11. Introduce oneself and others.

12. Prepare a Power point presentation on a given topic.

13. Translate paragraph --English to Hindi (vice -Versa) (Any4).

14. Write your experience in 50 words on (Four) given situations (Diary Entry).

15. Respond to the questions based on the given passages.

16. Deliver oral presentations using correct grammar and appropriate body language

Suggested Learning Materials / Books

1. Kumar, E. Suresh, Sreehari, P Savitri, Effective English with CD, Pearson Education.
2. Gnanamurli, English Grammar at a Glance, S. Chand.
3. CBSE, English Communicative (class X), Golden.
4. Dr. Anjana Tiwari, Communication Skills in English, Khanna Publishers, New Delhi.

Engineering Graphics

Rationale:

Normally Graphical representation are used for expressing intents and contents. Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop, express the ideas, and conveying the instructions which are used to carry out jobs in the field Engineering. The course illustrates the techniques of graphics in actual practice. This preliminary course aims at building a foundation for the further course in drawing and other allied subjects.

Course Outcomes:
Students will be able to achieve & demonstrate the following:
1. Draw geometrical figures and engineering curves.
2. Apply principles of orthographic projections for drawing given pictorial views.
3. Draw isometric views of given component or from orthographic projections.
4. Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
5. Draw free hand sketches of given engineering elements.
6. Use computer aided drafting packages

Unit		Name of Topic	No. of Sheet	No. of Hr.	
				Theory	Practical
01.	1.1-	Drawing Instruments and supporting material: Method to use them with applications standard size of sheets and I.S. codes for planning and layout	02	03	06
	1.2-	Letters and Numbers as per BIS: SP46-2003			
	1.3-	Scale (Plane and diagonal scale) reduced, enlarged and full size scale.			
02	2.1-	Curves and Conic Section:Concept and Understanding of focus, directrix, vertex and eccentricity.	02	03	04
	2.2-	To draw ellipse by directrix and arc of circle method			
	2.3-	To draw parabola by directrix and rectangle method To draw hyperbola by rectangle and directrix method.			
03	3.1-	Introduction to orthographic projection of first angle and third angle method and their symbols. Projection of point on principal, auxiliary and	01	03	04
	3.2-	profile planes. Idea of shortest distance.			
04	4.1-	Projection of straight line on principal plane in the following cases.	01	02	04
	4.2-	Parallel to both H.P and V.P Inclined to one plane and parallel to other plane.			
	4.3-	Inclined to both plane.			
	5.1-	Conversion of pictorial view into Orthographic			

05		Views – object containing plain surfaces, slanting surfaces, cylindrical surfaces.	01	02	04
06	6.1-	Projection of simple solid. Projection of Prism, Pyramid, Cone, Cylinder, and Cube with their axis Inclined to one reference plane and parallel to other.	01	02	04
07	7.1-	Isometric Scale and their use in drawing isometric views of single and compound solids. (Simple case only)	01	02	04
08	8.1-	Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching).	02	01	04
09	9.1-	AutoCAD Basics, Layers, multi-layer images, graphic interfaces, different views to be drawn.	03	10	16
		Total-	**14**	**28**	**50**

Suggested Learning Materials / Books

1. Bureau of Indian Standards, Engineering Drawing Practice for Schools and Colleges IS: SP-46, Third Reprint, October 1998 ISBN No. 81-7061-091-2.

2. Bhatt, N.D., Engineering Drawing, Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8.

3. Bhatt, N.D.; Panchal, V. M, Machine Drawing, Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6.

4. Dhawan, R.K., Engineering Drawing, S. Chand and Company New Delhi, ISBN No. 81-219-1431-0.

5. Mohan, K.R., Engineering Graphics, Dhanpat Rai & Publication Co.

6. Mastering AutoCAD, BPB Publication.

Engineering Workshop

Course Outcomes:

Students will be able to achieve & demonstrate the following:

1. Use firefighting tools and equipment.
2. Prepare job using different tools in fitting shop.
3. Perform various operations using plumbing and carpentry tools.
4. Prepare various welding joints.
5. Produce simple job using different sheet metal operations.

Unit 1: General Workshop Practice

Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols. First Aid. Fire, Causes of Fire, Basic ways of extinguishing the fire, Classification of fire, Class A,B,C,D, Firefighting equipment, fire extinguishers, and their types. Workshop Layout. Issue and return system of tools, equipment and consumables.

Unit 2: Fitting

Fitting hand tools bench vice, hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block , steel rule, twist drills, reamers, tap set, die set and their Specifications. Operation of fitting shops machineries - Drilling machine, Power saw, grinder their specifications and maintenance. Basic process chipping, filling, scraping, grinding, marking, sawing, drilling, tapping, dieing, reaming etc.

Unit 3: Plumbing

Plumbing hand tools pipe vice, pipe bending equipment, pipe wrenches, dies and their Specifications, Pipe fittings- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple and their Specifications. Operation of Machineries in plumbing shops- pipe bending machine their specifications and maintenance. Basic process cutting, threading.

Unit 4: Metal Joining

Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter and their Specifications. Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush and their Specifications. Operation of machineries in welding shops- arc welding transformer their specifications and maintenance. Welding Electrode, filler rod, fluxes, and solders. Basic process welding, brazing and soldering.

Unit 5: Carpentry

Types of artificial woods such as plywood, block board, hardboard, laminated boards, Veneer, fiber Boards and their applications. Wood working hand tools carpentry vice, marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares, and their specifications. Operation of wood working machineries -

Wood turning lathe, circular saw, their specifications and maintenance. Basic process- marking, sawing, planning, chiseling, turning, grooving, boring.

Unit 6: Sheet Metal

Sheet metal hand tools snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, groovers, limit set and their Specifications. Operation of machineries in sheet metal shops- sheet cutting and bending machine their specifications and maintenance. Basic process- marking, bending, folding, edging, seaming, staking, riveting.

<div align="center">

Laboratory Experiments / Practical

</div>

1. Identify fire extinguisher according to their specification.
2. Perform mock drill session in group of minimum 10 students for extinguishing fire.
3. Identify different tools used in workshop.
4. Prepare job using following operations: part 1 a. Marking operation as per drawing b. punching operation as per drawing c. Filing operation as per drawing d. sawing operation as per drawing e. drilling operation as per drawing f. tapping operation as per drawing.
5. Prepare T joint pipe fitting job as per given drawing (individually).
6. Prepare elbow joint pipe fitting job as per given drawing (individually).
7. Prepare bill of material for given pipeline layout (individually).
8. Practice different safety rules in welding shop as per given instruction.
9. Prepare lap joint using gas welding as per given drawing (individually).
10. Prepare butt joint using gas welding as per given drawing (individually).
11. Prepare utility job (like stool, benches, tables or similar jobs) involving arc welding and artificial wood as per given drawing (in group of 4 to 5 students) Fabrication operation involve measuring, marking, cutting, edge preparation, welding.
12. Prepare sheet metal utility job using following operations a. Cutting and Bending b. Edging c. End curling d. Lancing e. Soldering f. Riveting.
13. Draw sketches of various ancient tools.

Suggested Learning Materials / Books

1. Gupta, J.K.; Khurmi, R.S., A Textbook of Manufacturing Process (Workshop Tech.), S.Chand and Co. New Delhi ISBN:81-219-3092-8.
2. Hajra; Choudhary, Elements of Workshop Technology, Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146.
3. Sarathe, A.K., Engineering Workshop Practice, Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-51-6.

Fundamentals of ICT

Course Outcomes:

Students will be able to achieve & demonstrate the following

1. Use computer system and its peripherals for given purpose.
2. Prepare Business document using Word Processing Tool.
3. Analyze Data and represent it graphically using Spreadsheet.
4. Prepare professional Slide Show presentations.
5. Use different types of Web Browsers and Apps.
6. Explain concept and applications of Emerging Technologies.

Unit 1: Introduction to Computer System

Basics of Computer System: Overview of Hardware and Software: block diagram of Computer System, Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives). External Devices: Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive. Application Software: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device drivers.

Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth. Working with Operating Systems: Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.

Unit 2: Word Processing

Word Processing: Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application. Editing a Document: Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting. Changing the Layout of a Document: Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs. Inserting Elements to Word Documents: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture

Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat

table headings on subsequent page. Working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, Newsletter style columns, changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust.

Unit 3: Spreadsheets

Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. Editing Worksheet: Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze. Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks.

Working with Formula: Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF. Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet. Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.

Unit 4: Presentation Tool

Creating a Presentation: Outline of an effective presentation, identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs. Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format

Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. Working with Charts: Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.

Unit 5: Basics of Internet and Emerging Technologies

Creating World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines. Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking. Emerging Technologies: IOT, AI and ML, Drone Technologies, 3D Printing. Tools: Docs, Drive, forms, quiz, Translate and other Apps.

Laboratory Experiment / Practical

1. Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders.
2. Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraph level formatting.
3. Work with Images and Shapes in Word Processing.
4. Work with tables in Word Processing.
5. Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.
6. Create, open and edit Worksheet.
7. Formulas and functions in Worksheet.
8. Sort, Filter and validate data in Spreadsheet.
9. Charts for Visual Presentation in Spreadsheet.
10. Worksheet Printing.
11. Make Slide Show Presentation.
12. Use Tables and Charts in Slide.
13. a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation.
14. a) Internet connection configuration b) Use Internet and Web Services.
15. Working with Browsers.
16. Prepare Web Forms for Survey.
17. Prepare Web Forms for Quiz.

Suggested Learning Materials / Books

1. Goel, Anita, Computer Fundamentals, Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097.
2. Schwartz, Steve, Microsoft Office 2010 for Windows: Visual Quick Start, Pearson Education, New Delhi India, 2012, ISBN : 9788131766613.
3. Leete, Gurdy, Finkelstein Ellen, Mary Leete, OpenOffice.org for Dummies, Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220.
4. Miller, Michael, Computer Basics Absolute Beginner's Guide, Windows 10, QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516.

Yoga and Meditation

Course Outcomes:

Students will be able to achieve & demonstrate the following

1. Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.

2. Practice meditation regularly for improving concentration and better handling of stress and anxiety.

3. Follow healthy diet and hygienic practices for maintaining good health.

Laboratory Experiment / Practical Titles

1. Introduction: Presentations on Introduction to Yoga and its History.

   Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga.

2. Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up.

   Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go.

   Experiment 2 to 3 must be followed by shavasana for self-relaxation.

3. Lab Exp: 4 Perform Sarvangasna, Halasana, Kandharasana, (setubandhasana)

   LabExp: 5 Perform Bhujangasana,Naukasana,Mandukasana

   Lab Exp: 6 Perform Paschimottasana,Baddhakonasana,Bharadwajasana.

   Lab Exp: 7 Perform Veera Bhadrasana,Vrukshasana,Trikonasana. Follow up experiment 4 to 7 with shavasana for self-relaxation.

4. Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya

   Lab Exp: 9 Practice Kapalbhati Pranayam Kriya

   Lab Exp:10 Practice Bhramary Pranayam.

5. Lab Exp: 11 Perform sitting in Dhyan Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)

Suggested Learning Materials / Books

1. Swami Vivekananda, Patanjalis Yoga Sutras, Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13: 978-9354407017.

2. Swami Saradananda, Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your, Watkins Publishing (2019) ISBN-13: 978-1786782786.