

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

CHEMICAL ENGINEERING

B. Tech I – Year

I - Semester

THEORY						
S.No	Code	Subject	L	T	P/D	Credits
1	EG 111	English - I	2	0	0	2
2	MT 111	Mathematics – I	3	1	0	3
3	PY 112	Physics - I	3	0	0	3
4	CY 112	Inorganic Chemistry	4	1	0	3
5	CS 113	Programming and MATLAB Computing	3	1	0	3
6	CE 112	Environmental Studies	3	1	0	3
PRACTICALS						
7	EG 112	English Language Laboratory – I	0	0	2	1
8	PY 115	Engineering Physics Lab	0	0	3	2
9	CY 115	Inorganic Chemistry Lab	0	0	3	2
10	CS 115	Programming & MATLAB Computing Lab	0	0	3	2
11	ME 115	Workshop Practice	0	0	3	2
TOTAL			18	04	14	26

II – Semester

THEORY						
S.No	Code	Subject	L	T	P/D	Credits
1	EG 121	English – II	2	0	0	2
2	MT 121	Mathematics – II	3	1	0	3
3	PY 123	Physics – II	3	0	0	3
4	CY 122	Organic Chemistry	4	1	0	3
5	CS 121	Object Oriented Programming through C++	3	1	0	3
6	CH 121	Introduction to Chemical Engineering	4	0	0	3
PRACTICALS						
7	EG 122	English Language Laboratory – II	0	0	2	1
8	CY 124	Organic Chemistry Lab	0	0	3	2
9	CS 122	Programming Lab – II	0	0	3	2
10	ME 122	Engineering Drawing	0	0	3	2
TOTAL			19	03	11	24

ENGLISH –I
(common to all branches)

Instruction	2L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:**To enable the students to**

- To understand the role and importance of communication and to develop their basic communication skills in English.
- To enable the students to communicate through listening, speaking, reading and writing.
- To achieve a sound foundation and acquaint the students in the basics of grammar.
- To develop vocabulary and to use appropriate idiomatic expressions, one word substitutes etc.,
- To ensure students use learning materials prescribed, and to inculcate the habit of reading for pleasure.
- To enhance imaginative creative and critical thinking through literary texts.
- To enable students to write composition and draft different kinds of letters.

UNIT-I

Effective Communication: Role and importance of communication, process of communication, types of communication, barriers to communication, Verbal communication and non verbal communication, formal versus informal communication.

UNIT-II

Review of Grammar: 1.Tense and aspect 2.Articles 3.Prepositions 4.Voice 5.Concord 6. Direct and indirect speech

Vocabulary Enhancement: 1.Synonyms 2.Antonyms

UNIT-III

Reading comprehension and reading strategies.

Lessons Prescribed: 1. Barack Obama: A Trendsetter 2. Rendezvous with IndraNooyi

Text based exercises

Vocabulary Enhancement: 1. Homonyms 2. Homophones 3. Homographs 4. Words often confused

UNIT-IV

Writing Skills: Paragraph writing, Essay writing, Letter of application, Resume writing, Complaint letter with response.

Vocabulary Enhancement: Idiomatic expressions and one word substitutes.

UNIT-V

Soft skills - Introduction to soft skills, soft versus hard skills, professional etiquette in formal and semi formal situations, telephonic etiquette, E-mail etiquette.

Text Books:

1. "Essential English"- E Suresh Kumar et al.(Orient Balck Swan PVT Ltd.)
2. "Communication Skills and Soft Skills: An Integrated Approach"- E Suresh Kumar et al. (Pearson Publications)

Suggested Reading:

1. "English Vocabulary in Use" - Michael McCarthy (Cambridge University Press)
2. "Developing Communication Skills" – Krishna Mohan & Meera Banerjee (Macmillan)
3. "Murphy's English grammar" (Cambridge University Press)
4. "English Phrasal Verbs in use" - Michael McCarthy (Cambridge University Press)
5. "Written Communication in English" –Sarah Freeman (Orient Longman)
6. "Model Business letters, E-Mails and Other Business Documents" - Shirley, Taylor (Pearson) "Effective Technical Communication" – M. Ashraf Rizvi (Tata- McGraw Hill)
7. "Business Correspondence and Report Writing – R.C Sharma and Krishna Mohan (Tata McGrawHill)
8. Soft Skills, Alex, Publishers S. Chand

MATHEMATICS – I
(common to all branches except Bio-Tech)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT-I: Matrices: Rank of a matrix, Echelon form-Normal form-Consistency of a linear system of equations. Eigen values, Eigen vectors- properties (without proofs). Cayley- Hamilton Theorem (statement only) inverse and powers of a Matrix by Cayley-Hamilton Theorem. Reduction of Quadratic form to Canonical form by linear transformation, rank, positive, negative, definite, semi-definite, index and signature.

UNIT-II: Sequences and Series: Convergence and divergence, ratio test, Comparison test, integral test, Cauchy's root test, Raabes's test-Alternating series, Absolute and conditional convergence, Leibniz's Test (tests without proofs).

UNIT-III: Differential Calculus:

Mean value theorems (statements only) - Rolle's Theorem, Lagrange's theorem, Cauchy's theorem, and generalized mean value theorem (Taylor's Theorem), Geometrical interpretations. Curvature and Radius of curvature, center of curvature, circle of curvature. Evolutes, involutes and Envelopes. Functional dependence, Jacobian, Taylors series in two variables, Maxima and Minima for function of two variables with and without constraints.

UNIT-IV: Integral Calculus: Curve tracing – Cartesian, polar and parametric curves (standard curves only). Double and triple integrals change of order integration, applications of integration, rectification, areas, volumes and surfaces of solids of revolution in Cartesian and polar coordinates.

UNIT-V: Beta and Gamma Functions: Definitions of Beta and Gamma functions-elementary Properties of both Beta and Gamma functions, Relation between Beta and gamma functions, differentiation under the integral sign.

Text Books:

1. Advanced Engineering by Kreyszig, John Wiley & Sons -publishers.
2. Mathematical Methods of science and engineering, Aided with MATLAB, Kanti.B.Datta. Cengage Learning India Pvt.Ltd, 418 Pratapgang, New Delhi.
3. Mathematics for Engineers and Scientists by Alen Jaffery, 6th edition 2013 CRC press, Taylor & Francis Group.(Elsevier)
4. Advanced Engineering Mathematics by Michael Greenburg, Second Edition –Pearson Education.

Suggested Reading:

1. Mathematics for Engineers-a modern interactive approach by A.Craft and Robert Davison-Wiley
2. Applied Mathematics and physicists by Loius Pipes-McGraw Hill publishers.
3. Advanced Engineering Mathematics by R.K.Jain & S.R.K.Iyenger, 3rd edition, Narosa Publications
4. Matrices for Engineering Dynamics by AR Collar and A. Simpson-John Willey & sons
5. Essential Mathematics for Engineers by W.Bolton-Betterworth and Heineman
6. Mathematics for Physicists and Engineers- L F Landoviz, Publishers- Rienfold Book Corporation.
7. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
8. Engineering Mathematics by B.V.Ramana
9. Calculus by Smith and Minton
10. Applications of Linear Algebra by David.C Lay

PHYSICS – I
(Chemical Engg)

Instruction	3L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT – I

Waves and Oscillations: Simple harmonic motion – Differential equation and its solution – Torsional pendulum – Superposition of two mutually perpendicular linear SHMs of same frequency – Lissajous figures – Damped vibrations – Differential equation and its solution – Logarithmic decrement - Relaxation time – Quality factor – Forced vibrations – Differential equation and its solution – Amplitude resonance.

Ultrasonics: Introduction – Production of ultrasonics by piezoelectric and magnetostriction methods – Detection of ultrasonics– Determination of ultrasonic velocity in liquids – Engineering applications.

UNIT – II

Interference: Introduction – Division of amplitude & division of wavefront – Interference in thin films (reflected light) – Newton’s rings – Fresnel’s biprism.

Diffraction: Introduction – Distinction between Fresnel and Fraunhofer diffraction – Diffraction at single slit & double slit – Diffraction grating (N Slits).

UNIT – III

Polarization: Introduction – Brewster’s law – Malus’s law – Double refraction – Nicol’s prism – Quarter & Half wave plates – Optical activity – Laurent’s half shade polarimeter.

Lasers & Holography: Introduction – Characteristics of lasers – Spontaneous & stimulated emission of radiation – Einstein’s coefficients – Population inversion – Ruby laser – He-Ne laser – Semiconductor laser – Applications.

Basic principle of Holography – Recording & Reconstruction of hologram – Applications

UNIT - IV

Black Body Radiation: Introduction – Qualitative treatment of Kirchoff’s law, Stefan-Boltzmann’s law, and Wien’s displacement law – Spectrum of black body radiation – Wien’s law – Rayleigh Jean’s law – Planck’s law of black body radiation – Photoelectric effect – Compton effect.

UNIT – V

Elements of Statistical Mechanics: Introduction – Ensembles – Phase space – Thermodynamical probability – Boltzmann theorem on entropy – Maxwell-Boltzmann statistics – Partition function and thermodynamical quantities (Entropy, Helmholtz free energy, Total energy, Enthalpy, Gibb’s potential, Pressure of gas, Specific heat at constant volume) – Bose-Einstein statistics – Fermi-Dirac statistics.

Text Books:

1. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book Engineering Physics*, S. Chand Publications, 2014
2. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011
3. V. Rajendran, *Engineering Physics*, McGahill Education Publications, 2013

Suggested Reading:

1. R. Murugesan and KiruthigaSivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2005
2. M. Arumugam, *Materials Science*, Anuradha Publications, 2002.
3. Satyaprakash and Agarwal, *Statistical mechanics*, Kedannath Publications
4. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012
5. Hitendra K Malik and A.K. Singh, *Engineering Physics*, Tata McGahill Education Publications, 2011

INORGANIC CHEMISTRY
(Chemical Engg)

Instruction	4L + 1T Periods per week
Duration of University Examination	4 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	4

UNIT – I

Chemical Bonding : Introduction to molecular orbital theory, Linear combination of atomic orbital (LCAO) Method, Pictorial representation of combination of Atomic orbitals to form molecular orbitals, conditions for the combination of Atomic orbitals, energy level diagram for molecular orbitals, mixing of orbitals, bond order molecular orbital diagram for simple diatomic molecules of H₂, He₂⁺, N₂, O₂, O₂⁻ ion, NO and CO.

UNIT – II

Electrodepotentials : Oxidation – Reduction reactions Principle of electrode potential, standard electrode potential, Electrochemical series-applications.

Corrosion : Definition of Corrosion, Oxidation corrosion-mechanism, Electrochemical corrosion–Mechanism. Types of corrosion – Galvanic corrosion, differential aeration corrosion, pitting corrosion, water line corrosion. Corrosion control – Cathodic protection.

UNIT – III

Water chemistry : Hardness of water-Types, units of hardness, disadvantages of hard water, estimation of hardness of water by EDTA method, alkalinity of water and its determinations, numerical problems. Boiler troubles-scale and sludge formation, caustic embrittlement, boiler corrosion, priming and foaming-causes and effects. Specifications of potable water – treatment of water for drinking purpose – by boiling, sedimentation, coagulation, filtration, by ozone, concept of breakpoint chlorination of water, industrial requirements of water-Microbial testing.

UNIT – IV

Organometallic compounds: Introduction-Types of Metal-carbon bonds, preparation of organo metallic compounds of lithium and magnesium, synthetic uses of organometallic compounds, other uses of organometallic compounds. Hard and soft acids and bases, pearsons HSAB principle and its applications.

UNIT V

Fuels: Classification of fuels, characteristics of a good fuel. Calorific value: gross calorific value, net calorific value, determination of calorific value – bomb calorimeter.

Solid Fuels: Coal, analysis of coal – proximate analysis, ultimate analysis.

Liquid Fuels: Characteristics of liquid fuels, petroleum – fractional distillation of crude petroleum, octane number, cetane number, cracking of petrol – fixed bed catalytic cracking.

Gaseous Fuels: Advantages of gaseous fuels, liquid petroleum gas, CNG. Combustion- calculation of air required for combustion, analysis of flue gases – orsat apparatus.

Text Books :

1. Concise inorganic Chemistry; JD LEE
2. Engineering chemistry: Jain and Jain

Suggested reading

1. Principles of Inorganic Chemistry: B.R. Puri, L.R. Sharma & K.C. Kalia
2. Advanced Inorganic Chemistry: Cotton F.A. & Wilkinson G.
3. Inorganic Chemistry: P.L. Sony & Mohan Sultan Chand & Sons.
4. Engineering Chemistry: B.K. Sharma

**PROGRAMMING AND MATLAB COMPUTING
(Chemical Engg)**

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT-I

Introduction to computers: Components, Block diagram, Operating Systems, programming languages, Assembler, Interpreter, Compiler, loader, linkers, Number systems (Binary, Octal, Decimal and Hexa), Representation of numbers (fixed and floating point), Problem Solving: Algorithm, Flow Charts.

Types: Operators and Expressions: Variable Names, Data Types and Sizes, Constants, Declarations, Type Conversions, Operators, Precedence and Order of Evaluation.

UNIT-II

Control Flow and Behavior Flow Charts: Statements and Blocks, If-Else, Switch, loops: While, For, Do-While Break; Continue, Go to and labels.

UNIT-III

Functions: Basics of Functions, Parameter Passing Techniques, Functions returning non-integers, Recursion. Storage Classes, External Variables, Scope Rules, Header Files, Static and auto Variables, Register Variable, Block Structure, Initialization. C Preprocessor. Arrays: One, Two and Multi-dimensional arrays. Search: Linear and Binary, Sort: Selection and Bubble.

Pointers: Pointers and Addresses, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, Command line arguments.

UNIT-IV

Structures and Unions: Basics, Structure and functions, array of structures, Pointers to structures, Self referential structure, Union. Files: Basics and File Handling functions: Copy file and display file.

UNIT-V

MAT LAB C Programming, built-in functions, Creating Arrays, mathematical operations with Arrays, Two and three dimensional plots, user defined functions and function files, Relational and logical operators, Conditional statements-if-end, if-else-end, if – else if-else-end. Loops: for-end loop and while-end loop.

Nested loops and nested conditional statements, Break and continue commands.

Text Books:

1. Kernighan B.W. and Ritchien.M., "The C Programming language" 2nd Edition, Prentice-Hall of India, 2006.
2. Amos Gilat, "MATLAB: An Introduction with Application" 3rd Edition, John Wiley & Sons.

Suggested Reading:

1. Forouzan E. B.A., Gilberg F, "A Structured Programming Approach Using C" 2nd Edition, Thompson, 2003.
2. Rajaraman V. "The Fundamentals of Computers" 4th Edition, Prentice Hall of India, 2006.

ENVIRONMENTAL STUDIES
(common to all branches)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To equip the students with inputs on the environment, natural resources, ecosystems and Bio-diversity.
2. To enable the students become aware of environmental pollutions, causes, effects and control measures.
3. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

UNIT – I

Environmental Studies Definition, Scope and importance, need for public awareness. Natural resources: Water resources, use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Effects of modern agriculture, fertilizer pesticide problems, water logging salinity. Energy resources; growing energy needs, renewable and non-renewable energy sources. Land resources; land as a resource, land degradation, soil erosion and desertification.

UNIT – II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT – III

Biodiversity: Genetic species and ecosystem diversity, biogeographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT – IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, soil pollutions, noise pollution, thermal pollution and solid waste management. Environment protection act: Air, water, forest & wild life acts, issues involved in enforcement of environmental legislation.

UNIT – V

Social issues and the environment: Water conservation, watershed management, and environmental ethics. Climate change: global warming, acid rain, ozone layer depletion, Environmental protection act, population explosion.

Disaster Management: Types of disasters, impact of disasters on environment, infrastructure and development, Basic principles of disaster mitigation, disaster management, and methodology disaster management cycle and disaster management in India

Text Books:

1. Y. Anjaneyulu, Introduction to Environmental Science, B.S. Publications, 2004
2. S.S.Dara, A Text book of Environmental Chemistry & Pollution Control, S.Chand&Comp. Ltd, 2000.

Suggested Reading:

1. De A.K. *Environmental Chemistry*, Wiley Eastern Ltd., 1989.
2. Odum E.P. *Fundamentals of Ecology*, W.B. Saunders Co., USA, 1975.
3. Rao M.N. and Datta A.K., *Wastewater treatment*, Oxford & IBH publishing Co., 1987.
4. Miller T.G. Jr. *Environmental Science*, Wordsworth Publishing Co., 1984.
5. Benny Joseph, *Environmental Studies*, Tata Mc. Graw Hill education Pvt. Ltd., 2000
6. Raman Siva Kumar, *Introduction to environmental Science and Engineering*, Tata Mc. Graw Hill education Pvt. Ltd., 2010.

ENGLISH LANGUAGE LABORATORY – I
(common to all branches)

Instruction	2 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	1

Computer Assisted Language Learning Lab (CALL)

Introduction:

The language lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

The following are the **objectives** of the course:

1. To make students recognize the sounds of English through audio – visual aids and computer software.
2. To help them overcome their inhibitions and self consciousness while speaking in English and to build their confidence. The focus shall be on fluency rather than accuracy.
3. To enable them to speak English correctly with focus on stress and intonation.
4. To expose the students to a variety of self instructional, learner friendly modes of communication.

Syllabus:

1. Introduction to English Phonetics: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. Sound system of English: Phonetic sounds and phonemic sounds, introduction to International Phonetic Alphabet, classification and description of English phonemic sounds, minimal pairs. The syllable: types of syllables, consonant clusters.
3. Aspects of connected speech: Strong forms, weak forms, contracted forms, elision.

Interactive Communication Skills Lab (ICS LAB)

Introduction:

The objective of the course is to enrich interpretation skills, problem solving skills, interpersonal skills, analytical skills and leadership skills of the students, the most essential requirement of communication skills for Engineering students. The course lays emphasis on the language integrated skills in simple and comprehensive manner.

The following are the **objectives** of the course:

1. To expose the students to a team environment and how best one works with teams while adapting themselves to a corporate environment and to make business presentations.
2. Use proper body language expressions in presentation and speeches.
3. Depict situations in the dialogue that are relevant and useful to the learner, retain the truth value in the dialogue.
4. Public speaking is to be shown in action by incorporating narrative examples and extracts from speeches relating directly to students actual life experiences.

Syllabus:

1. Situational dialogues & role plays.
2. Group discussions: Objectives of a GD, types of GD's, initiating, continuing and concluding of GD.
3. Public speaking: Advantages of public speaking, essentials of an effective speech, rehearsal techniques, planning and delivering speeches.

Suggested Reading:

1. E Suresh Kumar et al. **English for Success** (with CD), Cambridge University Press India Pvt. Ltd. 2010.
2. T Balasubramanian. **A Textbook of English Phonetics for Indian Students**, Macmillan, 2008.
3. Kavita Tyagi and Padma Misra. **Professional Communication**, PHI Learning Pvt. Ltd, 2011
4. J Sethi et al. **A Practical Course in English Pronunciation** (with CD), Prentice Hall India, 2005.
5. Meenakshi Raman and Sangeeta Sharma. **Technical Communication**, Oxford University Press 2009.

**ENGINEERING PHYSICS LAB
(Chemical Engg)**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Compound Pendulum – Determination of 'g' by Compound pendulum
2. Helmholtz Resonator – Determination of resonating volume of air and neck correction
3. 'μ' of the Lenses – Determination of refractive index of given lenses
4. 'μ' of the Prism – Determination of refractive index of given prism
5. Newton's Rings – Determination of wavelength of given monochromatic source
6. Diffraction Grating – Determination of wavelengths of two yellow lines of mercury light
7. Malus's Law – Verification of Malus's law
8. Polarimeter– Determination of specific rotation of glucose
9. R.P. of Telescope – Determination of resolving power of given telescope
10. Energy Gap – Determination of energy gap of given semiconductor
11. Hall Effect – Determination of Hall coefficient, carrier concentration & mobility of charge carrier of given semiconductor specimen
12. B-H Curve – Determination of hysteresis loss of given specimen
13. M & H Values – Determination of magnetic moment given bar magnet & horizontal component of Earth's magnetic field
14. Solar Cell – Study I-V characteristics of given solar cell and calculation of fill factorefficiency and series resistance
15. Dielectric Constant – Determination of dielectric constant of given PZT sample
16. Planck's Constant –Determination of Planck's Constant using photo cell

**INORGANIC CHEMISTRY LAB
(Chemical Engg)**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

I. Systematic semi micro qualitative analysis of mixture containing two anions (non interfering) and two cations : CO_3^{2-} , Cl^- , Br^- , I^- , CH_3COO^- , NO_3^- , SO_4^{2-} , PO_4^{3-} , Pb^{+2} , Bi^{+3} , Cd^{+2} , Fe^{+3} , Al^{+3} , Zn^{+2} , Mn^{+2} , Ca^{+2} , Sr^{+2} , Ba^{+2} , Mg^{+2} , NH_4^+ .

II. Volumetric Analysis

1. Estimation of Fe^{2+} by Permanganometric titration.
2. Estimation of Copper by Iodometry
3. Estimation of Hardness of water by EDTA method.

**PROGRAMMING AND MATLAB COMPUTING LAB
(Chemical Engg)**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

C-Programming:

1. Finding the maximum and minimum of given set of numbers.
2. Finding Roots of a Quadratic Equation.
3. Sin x and Cos x values using series expansion.
4. Conversion of Binary to Decimal, Octal, Hexa and vice versa.
5. Generating a Pascal triangle.
6. Recursion: Factorial, Fibonacci, GCD.
7. Matrix addition and multiplication using arrays.
8. Bubble Sort, Selection Sort.
9. Linear Search and Binary Search.
10. Functions for string manipulations.
11. Finding the No. of characters, words and lines of given text file.
12. File Handling programs.

MATLAB Computing:

1. Roots of a Polynomial.
2. Curve fitting using polyfit function.
3. Solving equation with one variable.
4. Finding minimum and maximum of a function.

WORKSHOP PRACTICE
(Chemical Engg & Bio-Tech)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Trades for Practice

1. Carpentry	2. Plumbing	3. House Wiring	4. Welding and demonstration of lathe operations
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Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a cross lap joint on the given wooden piece according to the given dimensions.
3. To make a Tee lap joint on the given wooden piece according to the given dimensions.
4. To make a dove tail-joint on the given wooden piece according to the given dimensions.
5. To make a bridle joint on the given wooden piece according to the given dimensions.

Exercises in Plumbing

1. To make external threads for GI pipes using dies.
2. To connect the GI pipes as per the given diagram using taps, couplings & bends.
3. To connect the GI pipes as per the given diagram using, couplings, unions, reducer & bends.
4. To connect the GI pipes as per the given diagram using shower, tap & valves
5. Demonstration of above exercise by giving water connection.

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bell push.
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs.
3. Wiring of two light points connected in parallel from two single pole switches and a three pin socket
4. Stair case wiring-wiring of one light point controlled from two different places independently using two 2-way switches.
5. Go-down wiring.

Exercises in Welding

1. To make a butt joint using arc welding on the given MS work pieces
2. To make a lap joint using arc welding on the given MS work pieces
3. To make a T-fillet joint using arc welding on the given MS work pieces.
4. To make a corner joint using arc welding on the given MS work pieces.
5. To join two thin sheets of GI material using Electric Resistance welding.

Demonstration of operations on lathe

Facing, turning, taper turning, grooving, knurling and boring operations over a cylindrical mild steel bar

Note: A minimum of 12 exercises from the above need to be done