



B.E. MECHATRONICS ENGINEERING
REGULATION 2020
FIRST YEAR (I & II Semester)–CURRICULUM & SYLLABI

SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	HS1171	Communicative English	HS	3	0	0	3	3
2	MA1171	Engineering Mathematics-I	BS	3	1	0	4	4
3	PH1171	Engineering Physics	BS	3	0	0	3	3
4	CY1171	Engineering Chemistry	BS	3	0	0	3	3
5	GE1171	Fundamentals of Computing and Programming	ES	3	0	0	3	3
PRACTICALS								
6	BS1181	Basic Sciences Laboratory	BS	0	0	2	2	1
7	GE1181	Fundamentals of Computing and Programming Laboratory	ES	0	0	4	4	2
TOTAL				15	1	6	22	19

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	CATE GOR Y	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDIT S
				L	T	P		
THEORY								
1	HS1271	Technical English	HS	3	0	0	3	3
2	MA1271	Engineering Mathematics-II	BS	3	1	0	4	4
3	PH1271	Materials Science	BS	3	0	0	3	3
4	BS1271	Environmental Science and Engineering	BS	3	0	0	3	3
5	GE1271	Engineering Graphics	ES	1	0	4	5	3
6	GE1272	Engineering Mechanics	PC	3	0	0	3	3
PRACTICALS								
7	GE1281	Engineering Practices Laboratory	ES	0	0	4	4	2
8	MT1211	Computer Aided Drafting Laboratory	PC	0	0	4	4	2
TOTAL				16	1	12	29	23

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to

- Develop the basic reading and writing skills of first year engineering and technology students
- Help learners develop their listening skills, which will enable them listen to lectures and comprehend them by asking questions; seeking clarifications
- Help learners develop their speaking skills and speak fluently in real contexts
- Help learners develop vocabulary of a general kind by developing their reading skills

UNIT I SHARING PERSONAL INFORMATION**9**

Listening- short texts- Short formal and informal conversations about current affairs. **Speaking-** introducing oneself - exchanging personal information **Reading-** Reading- short comprehension passages and fill-in the gap, Practice in skimming, scanning and predicting content and end up effectively **-Writing-** Completing sentences using connectors - Developing hints based on the true facts **-Language development-** Parts of speech- Tenses-modal verbs Language Ladders: Wh- Questions/ Yes or no questions - **Vocabulary development** -Prefixes-suffixes- Changes in meaning.

UNIT II GENERAL READING AND FREE WRITING**9**

Listening -telephonic conversations. **Speaking** – sharing information of personal kind - redundancies – taking leave- **Reading** - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- Free writing-Summary writing –**Language development** – prepositions, conjunctions, articles, count/uncount nouns- **Vocabulary development**-guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT**9**

Listening – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions **Reading-** short texts and longer passages (close reading) **Writing**– constructing a paragraph of their own choice- use of reference words and discourse markers-coherence-jumbled sentences . **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development** – single word substitutes- meanings of root words.

UNIT IV READING AND LANGUAGE DEVELOPMENT**9**

Listening- listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend. **Reading-** comprehension reading longer texts- reading different types of texts- magazines Writing- letter writing, informal or personal letters-e-mails-conventions of personal email-**Language development-**Phrasal Verbs- **Vocabulary Development-** synonyms-antonyms

UNIT V EXTENDED WRITING**9**

Listening –listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Reading**- longer texts- close reading –**Writing**- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing- **Language development**- Collocations used in everyday life - **Vocabulary Development** - Fixed and Semi-Fixed Expressions used in informal situations

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

- CO1: Comprehend articles of a general kind in magazines and newspapers.
- CO2: Apply acquired knowledge of conventions in diverse contexts by participating effectively in informal conversations
- CO3: Make use of standard English to express views coherently and explicitly in formal communication.
- CO4: Demonstrate proper grammar usage in the writing of personal letters and emails in English
- CO5: Illustrate their ability to write short essays of a general kind

TEXTBOOKS:

1. Richards, C. Jack, 2015, *Interchange Students' Book-2* , CUP, New Delhi.
2. Sanjay Kumar & PushpLata, 2018, *Communication Skills*: Oxford University Press, Chennai.

REFERENCES:

1. Shoba, KN 2019, *Communicative English – A Workbook*, Cambridge, New Delhi.
2. Bailey & Stephen 2011, *Academic Writing: A practical guide for students*. Rutledge, New York.
3. Comfort , Jeremy, [Pamela RogersonRevell](#), [Trish Stott](#) & [Derek Utley](#) 2011, *Speaking Effectively: Developing Speaking Skills for Business English*. Cambridge University Press, Cambridge.
4. Dutt P. Kiranmai & Rajeevan Geeta 2013, *Basic Communication Skills*, Foundation Books.
5. Means, L. Thomas & Elaine Langlois 2007, *English & Communication for Colleges*, Cengage Learning ,USA.
6. Redston, Chris & Gillies Cunningham 2005, *Face2Face (Pre-intermediate Student's Book & Workbook)*, Cambridge University Press, New Delhi.

WEB SOURCES:

1. <http://learnenglish.britishcouncil.org/grammar/intermediate-to-upper-intermediate>
2. <https://www.bbc.co.uk/learningenglish/basic-grammar>

MA1171

ENGINEERING MATHEMATICS – I
(Common to all branches of B.E./ B.Tech Programmes)

L	T	P	C
3	1	0	4

PREREQUISITE: Basics of Matrices–Limit of a function – Continuity – Differentiation – Integration – Elementary calculus. (Not for Examination)

OBJECTIVES:

To enable the students to

- Gain knowledge in using matrix theory techniques to solve problems.
- Understand the various techniques in differential calculus to obtain the maxima and minima of a function.
- Understand the concept of evolutes and envelopes.
- Understand the concept of integration for finding Length of curves, Volumes of solid of revolution, Surface areas of revolution.
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES

12

Characteristic equation – Eigen values and Eigen vectors – Properties – Cayley-Hamilton Theorem (without proof) – Applications: Inverse and powers of a matrix – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II APPLICATIONS OF DIFFERENTIAL CALCULUS

12

Curvature in Cartesian coordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Increasing and Decreasing functions – Maxima and Minima of functions of single variable using first derivative test.

UNIT III APPLICATIONS OF INTEGRAL CALCULUS

12

Beta and Gamma Function– Properties– Evaluation of integrals using Beta and Gamma function– Length of curves – Surface areas of revolution.

UNIT IV PARTIAL DIFFERENTIATION AND ITS APPLICATIONS

12

Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Partial differentiation of implicit functions – Jacobians – Taylor’s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS AND ITS APPLICATIONS

12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

- CO1: Apply the concept of Eigen values and eigenvectors, diagonalization of a matrix for solving Engineering problems.
- CO2: Apply differentiation to solve maxima and minima problems.
- CO3: Apply integration to compute Length of curves and Surface areas of revolution.
- CO4: Apply Partial differentiation to compute Maxima and minima of functions of two variables.
- CO5: Apply multiple integrals technique to calculate area and volume.

TEXT BOOKS:

1. Grewal, B S 2014, *Higher Engineering Mathematics*, Khanna Publishers, 43rd Edition, New Delhi.
2. Kreyszig Erwin 2016, *Advanced Engineering Mathematics*, John Wiley and Sons, 10th Edition, New Delhi.

REFERENCES:

1. Anton, H, Bivens, I & Davis, S 2016, *Calculus*, Wiley, 10thed.
2. Jain, RK, &lyengar, SRK 2007, *Advanced Engineering Mathematics*, NarosPublications, 3rd Edition, New Delhi.
3. Narayanan, S&Manicavachagom Pillai, T K 2007, *Calculus Volume I and II*, S. Viswanathan Publishers Pvt. Ltd., Chennai.
4. Peter V.O'Neil 2007, *Advanced Engineering Mathematics*, Cengage learning 7thEdition.
5. Weir, MD, & Joel Hass 2016, *Thomas Calculus*, Pearson Education 12thed, India.

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I ULTRASONICS**9**

Generation of ultrasonic waves –Magnetostriction generator – Piezoelectric generator - detection of ultrasonic waves - properties – cavitation - velocity measurement – acoustic grating - Industrial applications: SONAR - Non Destructive Testing - A,B and C –scan displays.

UNIT II LASER AND FIBER OPTICS**9**

Lasers: population of energy levels, Einstein's A and B coefficients– Semiconductor lasers: homo junction and heterojunction.

Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibre (material, refractive index profile and number of modes) –sensors: pressure and displacement, optical fiber communication system, endoscope.

UNIT III THERMAL PHYSICS**9**

Thermal conductivity – Forbe's and Lee's disc method- conduction through compound media (series and parallel) - thermal expansion of solids and liquids – thermal insulation- Applications: heat exchangers, refrigerators, ovens and solar water heater.

UNIT IV QUANTUM PHYSICS**9**

Postulates of quantum mechanics - Black body radiation – Planck's theory (derivation) - wave particle duality – electron diffraction – degenerate and non-degenerate states –physical significance of wavefunction- Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional box - scanning tunneling microscope.

UNIT V CRYSTAL PHYSICS**9**

Crystalline and non-crystalline solids - unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances - coordination number and packing factor for SC, BCC, FCC and HCP - crystal defects: point defect and line defect - role of imperfections in plastic deformation - Bridgman and Czochralski crystal growth techniques.

TOTAL: 45 Hours**COURSE OUTCOMES:**

Upon completion of the course, the student will be able to

- CO1: Understand the properties, generation and applications of ultrasonic waves.
- CO2: Realize the properties & principle of laser, and propagation of light in optical fibre.
- CO3: Explain the idea of heat conduction in different media and understand the real applications of heat transfer.
- CO4: Comprehend the quantum concepts in materials.
- CO5: Describe the various types of atomic arrangements and imperfections in crystal.

TEXT BOOKS:

1. Bhattacharya, DK, &Poonam, T 2015, *Engineering Physics* Oxford University Press.
2. John Wilson, Hawkes, JFB 1998, *Optoelectronics: An Introduction*, Prentice Hall of India.
3. Gaur, RK & Gupta, SL 2012, *Engineering Physics*, DhanpatRai Publishers.
4. Pandey, BK &Chaturvedi, S 2012, *Engineering Physics*,Cengage Learning India.
5. Charles Kittel 2007, *Introduction to Solid State Physics*, 7thed, Wiley India.

REFERENCES:

1. Halliday, D, Resnick, R & Walker, J 2015, *Principles of Physics*, Wiley.
2. Serway, RA. & Jewett, JW 2010, *Physics for Scientists and Engineers*, Cengage Learning, 2010.
3. Tipler, PA &Mosca, G 2007, *Physics for Scientists and Engineers, USA*.
4. Mathews, PM &Venkatesan 2010, *A Text book of Quantum Mechanics*, Tata McGraw hill.
5. William T. Silfvast 2004, *Laser Fundamentals*, 2nded, Cambridge University press, New York.
6. Shankar, R 2014, *Fundamentals of Physics*, Yale University Press, New Haven and London.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/122/106/122106034/> (Quantum Physics)
2. <https://nptel.ac.in/courses/115/105/115105099/> (Solid state Physics)
3. <https://nptel.ac.in/courses/115/107/115107095/> (Fiber Optics)
4. <https://nptel.ac.in/courses/113/106/113106070/> (Ultrasonic testing)

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OBJECTIVES:

To enable the students to understand

- Water quality parameters and water treatment techniques.
- Principles and applications of electrochemistry, its processes and storage devices.
- The various energy sources and their applications
- The basic concepts of polymers, their properties and some of the important applications.
- The basic principles and preparatory methods of engineering materials and nanomaterials.

UNIT I WATER AND ITS TREATMENT 9

Water – sources and impurities – water quality parameters: colour, odour, pH, hardness, alkalinity, TDS, COD and BOD. Boiler feed water – requirement – troubles (scale & sludge, caustic embrittlement, boiler corrosion and priming & foaming). Internal conditioning – phosphate, calgon and carbonate treatment. External conditioning - zeolite (permutit) and ion exchange demineralization. Municipal water treatment process – primary (screening, sedimentation and coagulation), secondary (activated sludge process and trickling filter process) and tertiary (ozonolysis, UV treatment, chlorination, reverse osmosis).

UNIT II ELECTROCHEMISTRY 9

Introduction – Electrochemical cells – Reversible and irreversible cells – Concentration Cells - EMF - Measurement of EMF - Electrode potential – Single Electrode Potential – Nernst Equation (Problems) – Reference electrodes – Calomel electrode – Glass electrode – EMF Series – Significance – Applications of EMF measurements: Potentiometric Titrations. Storage Devices: Batteries and Super capacitors - Types of batteries - alkaline, lead-acid, nickel-cadmium and lithium batteries - construction, working and commercial applications. Fuel Cells – H₂-O₂ fuel cell – Microbial Fuel Cells.

UNIT III ENERGY SOURCES 9

Conventional and Non Conventional Energy Sources – Conventional: Fossil Fuels - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG). Non Conventional: Solar energy – Solar Energy Conversion – Solar Cells, Wind Energy, Nuclear Energy – Nuclear fission and fusion – Nuclear chain reactions - Nuclear reactor – Nuclear Power Plant – Breeder Reactor.

UNIT IV POLYMERS 9

Introduction: Functionality - degree of polymerization- Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and coordination); condensation and copolymerization. Properties of polymers: T_g, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Synthesis, Properties and uses of: PE, PVC, Nylon 66, Bakelite, Epoxy resins.

UNIT V ENGINEERING MATERIALS 9

Introduction - Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses - Glass - manufacture, types, properties and uses.

Nanomaterials - Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties – Synthesis of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, Precipitation & electrochemical deposition – General Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

CO1: Identify the purity of water samples as per industry requirements.

CO2: Apply basic concepts of electrochemistry in energy storage devices

CO3: Recognize different forms of energy resources to apply them for suitable applications in energy sectors

CO4: Illustrate the structure and properties of polymeric molecules.

CO5: Identify the properties of various materials used in engineering and technology applications

TEXT BOOKS:

1. Jain, PC & Monica Jain 2015, *Engineering Chemistry*, 16thed, DhanpatRai Publishing Company (P) Ltd, New Delhi.
2. Sivasankar B 2010, *Engineering Chemistry*, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
3. Dara, SS &Umare, SS 2015, *A text book of Engineering Chemistry*, 2nded, Chand & Company Ltd, New Delhi.

REFERENCES:

1. Schdeva, MV 2017, *Basics of Nano Chemistry*, Anmol Publications Pvt Ltd.
2. Sivasankar, B 2012, *Instrumental Methods of Analysis*, Oxford University Press.
3. Friedrich Emich 2017, *Engineering Chemistry*, Scientific International Ltd.
4. Gowariker, VR, Viswanathan, NV &JayadevSreedhar 2019, *Polymer Science*, 6thed, New Age International Publishers.

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to:

- Provide the basics of computational problem solving
- Develop simple C Programs using basic programming constructs
- Develop simple C programs to work on arrays and strings
- Develop simple applications in C using functions and pointers
- Develop basic applications in C using structure and files

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING 7

Fundamentals of Computing – Basic computer organization – Generation of Computers – Evolution of programming languages – Need for logical analysis and thinking – Number System – Algorithms – Pseudocodes – Flowcharts.

SUGGESTED TOOL: Raptor tool

SUGGESTED ACTIVITIES:

Draw a flow chart and write a pseudocode to perform the following operations:

- i. Swap two numbers without temporary variable
- ii. Leap year or not
- iii. Sum of even numbers in range of 1 to N
- iv. Prime or not
- v. Find minimum in a given array of elements
- vi. Solve Towers of Hanoi problem

UNIT II BASICS OF C PROGRAMMING 11

Introduction to C programming – Structure of C program – C programming: Data Types – Storage classes – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements.

SUGGESTED ACTIVITIES:

Write a C Program to perform the following operations:

- i. Simple calculator
- ii. GCD
- iii. Fibonacci series

UNIT III ARRAYS AND STRINGS 10

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – String operations.

SUGGESTED ACTIVITIES:

Write a C Program to perform the following operations:

- i. Computing Mean, Median and Mode
- ii. Matrix operations (Addition, Scaling, Multiplication and Transpose)
- iii. Bubble Sort
- iv. Linear Search
- v. String operations (length, compare, concatenate, copy, reverse)

UNIT IV FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function definition, function call, Built-in functions – Recursion – Pointers – Pointer operators – Pointer arithmetic – Parameter passing: Pass by value, Pass by reference.

SUGGESTED ACTIVITIES:

Write a C Program to perform the following operations:

- i. String functions, math functions
- ii. Computation of Sine series
- iii. Scientific calculator using built-in functions
- iv. Factorial using recursive functions
- v. Swapping of two numbers using pass by value
- vi. Changing the value of a variable using pass by reference

UNITV STRUCTURES AND FILE PROCESSING

8

Structure – Nested structures – Array of structures – Files– Types of file processing: Sequential access, Random access – Command line arguments – Pre-processor directives.

SUGGESTED ACTIVITIES:

Write a C Program to perform the following operations:

- i. Student mark sheet preparation using Structure
- ii. Read the content from a text file, convert it to upper case and store it in another text file
- iii. Search a content from the student data file (Sequential access)
- iv. Fetch nth record from the student data file (Random access)

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

- CO1: Develop algorithms for simple computational problems
- CO2: Develop simple applications in C using basic constructs
- CO3: Design and implement applications using arrays and strings
- CO4: Develop and implement applications in C using functions and pointers
- CO5: Develop applications in C using structures and files

TEXTBOOKS:

1. Reema Thareja, 2016, *Programming in C*, 2nded, Oxford University Press.
2. Forouzan, BA & Gilberg, RF, 2006, *Computer Science: A structured programming approach using C*, 3rded, Cengage Learning.
3. Kernighan, B.W & Ritchie, D.M, 2006, *The C Programming language*, 2nded, Pearson Education.

REFERENCES:

1. Paul Deitel & Harvey Deitel, *C How to Program*, 7thed, Pearson Publication.
2. Juneja, BL & Anita Seth, 2011, *Programming in C*, CENGAGE Learning India Pvt. Ltd.
3. Pradip Dey & Manas Ghosh, 2009, *Fundamentals of Computing and Programming in C*, Oxford University Press.
4. Anita Goel & Ajay Mittal, 2011, *Computer Fundamentals and Programming in C*, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia.
5. Byron S. Gottfried, 1996, *Schaum's Outline of Theory and Problems of Programming with C*, McGraw-Hill Education.

L	T	P	C
0	0	2	1

PHYSICS LABORATORY

OBJECTIVES:

To introduce different experiments to test basic understanding of physics concepts applied in optics, ultrasonics, thermal and semiconductor physics.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

- (a) Determination of wavelength, and particle size using Laser.
(b) Determination of acceptance angle in an optical fiber.
- Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
- Determination of wavelength of mercury spectrum – spectrometer grating.
- Determination of band gap of a semiconductor.
- Determination of thickness of a thin wire – Air wedge method.
- Determination of Young's modulus by Uniform bending method.

Experiments using LabVIEW: (Demonstration only)

- Calibration of Ammeter/Voltmeter using potentiometer.
- Sensors - Displacement, Pressure, Strain and Acoustical sensors.

TOTAL: 15 PERIODS

CHEMISTRY LABORATORY

Course Objectives:

To enable the students to

- Inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- Familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

LIST OF EXPERIMENTS: (Any 6 Experiments)

- Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
- Determination of total, temporary & permanent hardness of water by EDTA method.
- Determination of DO content of water sample by Winkler's method.
- Determination of chloride content of water sample by argentometric method.
- Estimation of copper content of the given solution by EDTA method
- Determination of strength of given hydrochloric acid using pH meter.
- Determination of strength of acids in a mixture of acids using conductivity meter.
- Estimation of iron content of the given solution using potentiometer.

TOTAL: 15 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

- CO1: Interpret the elastic property of the materials using non-uniform bending method and the size of the microscopic particles with the help of a laser.
- CO2: Find the bandgap of the semiconductor using Four probe setup and compressibility of the given liquid and velocity of the ultrasonic waves using an ultrasonic interferometer.
- CO3: Illustrate the wavelength of different colours present in the polychromatic light source using grating
- CO4: Analyse the water quality parameters like hardness, Alkalinity, Chloride, DO in the given water sample by volumetric method
- CO5: Determine the quantity of the analyte in the given sample by volumetric method with the help of instruments

TEXT BOOKS:

1. Jeffery, GH, Bassett, J, Mendham, J & Denney, RC, 2014, "*Vogel's Textbook of Quantitative Chemical Analysis*", 8thed.

**GE1181 FUNDAMENTALS OF COMPUTING AND PROGRAMMING
LABORATORY**
(Common to all branches of B.E / B.Tech Programmes)

L	T	P	C
0	0	4	2

OBJECTIVES:

To enable the students to

- Learn the use of office automation tools
- Represent the solution to simple problems using algorithm and flowchart.
- Develop simple programs in C using basic constructs.
- Develop simple programs to solve primitive applications in C using strings, pointers, functions, structures and files

LIST OF EXPERIMENTS:

1. OFFICE APPLICATION SOFTWARE

- a. Word Processing
 - I. Document creation, Text manipulation with Scientific notations
 - II. Table creation, Table formatting and Conversion
 - III. Letter preparation and mail merge
 - IV. Drawing - flow Chart
- b. Spread Sheet
 - I. Formula - formula editor, Sorting
 - II. Chart - Line, XY, Bar and Pie
- c. Power point
 - I. Advertisement making
 - II. Presentation preparation

2. DRAW FLOWCHART USING RAPTOR TOOL TO:

- I. Find area of a circle
- II. Find the biggest of two numbers
- III. Compute grade for given mark
- IV. Find the sum and average of 'N' numbers

3. C PROGRAMS USING I/O STATEMENTS AND EXPRESSIONS TO:

- I. Find area and volume of shapes
- II. Convert centigrade to Fahrenheit
- III. Swap two numbers with and without using temporary variable

4. C PROGRAMS USING DECISION-MAKING CONSTRUCTS TO:

- I. Find the biggest of two numbers
- II. Compute grade for given mark
- III. Check whether the given number is Armstrong number or not

5. C PROGRAMS USING ONE DIMENSIONAL ARRAY TO:

- I. Perform linear search
- II. Sort the given numbers using bubble sort
- III. Populate an array with height of persons and find how many persons are above the average height.

6. C PROGRAMS USING TWO DIMENSIONAL ARRAY TO:

- III. Add two matrices
- IV. Multiply two matrices
- V. Find sum of diagonal elements of a Matrix

7. C PROGRAMS USING FUNCTIONS TO:

- VI. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
- VII. Find the factorial of a number using recursion
- VIII. Swap the value of two numbers (Call by value and Call by reference)

IX. Sort the list of numbers using functions

8. C PROGRAMS USING STRINGS TO:

- a. Check whether the given string is palindrome or not (Without using built-in functions)
- b. From a given paragraph perform the following using built-in functions:

9. FIND THE TOTAL NUMBER OF WORDS.

- I. Capitalize the first word of each sentence.
- II. Replace a given word with another word.

10. C PROGRAMS USING STRUCTURES TO:

- a. Compute internal marks of students for five different subjects using structures and files.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

CO1: Understand the use of office automation tools

CO2: Represent pictorially the solution for simple problems.

CO3: Develop C programs for simple applications making use of basic constructs, arrays and strings.

CO4: Develop C programs to solve simple applications using functions, recursion and pointers.

CO5: Build C programs to solve simple applications using structure and files.

L	T	P	C
3	0	0	3

OBJECTIVES:

To enable the students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I TECHNICAL WRITING-AN INTRODUCTION

9

Listening- Listening to talks of scientists / Indian speakers – Fill- in exercises- **Speaking** Asking for and giving directions for ESL students- **Reading** – reading short technical texts from journals- newspapers - **Writing-** purpose statements – extended definitions - Writing instructions- checklists-recommendations-**Vocabulary Development-** technical vocabulary **Language Development** –subject verb agreement – compound words

UNIT II INTERPRETATION OF GRAPHICAL REPRESENTATION

9

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a graphical interpretation-**Reading-**Error Correction- Paragraph Completion- Graphical Representation- **Writing-** interpreting charts, graphs, paragraphing- **Vocabulary Development-** vocabulary used in formal letters/emails and reports. **Language Development-** personal passive voice, numerical adjectives.

UNIT III JOB APPLICATIONS

9

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing-** email etiquette- job application – cover letter –Resume preparation(via email and hard copy)- **Vocabulary Development-** Perfect phrases for interviews-. **Language Development-** clauses- if conditionals

UNIT IV REPORT WRITING

9

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey report-**Vocabulary Development-** prefixes and suffixes/Synonyms- Misspelled words. **Language Development-** embedded sentences.

UNIT V ESSAY WRITING

9

Listening- Listening to TED Talks that are technical in nature -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading;

Writing-analytical, descriptive and issue based essays- **Vocabulary Development**- verbal analogies **Language Development**- Commonly Used Idioms and Phrases.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

- CO1: Utilize basic grammatical skills in writing instructions, checklists and recommendations
- CO2: Apply acquired knowledge of Grammar to prepare formal letters and e-mails.
- CO3: Develop reading skills by familiarizing with different types of reading strategies.
- CO4: Construct documents with respect to career
- CO5: Make use of communicative English in report preparation and minutes.

TEXT BOOKS:

1. Sam Praveen.D& K.N. Shoba, 2020, *A Course in Technical English*, CUP, Chennai.
2. Raman & Sharma, 2018, *Technical Communication*, OUP, New Delhi.

REFERENCES:

1. Richard Rossner, 2017 *Language Teaching Competences*, OUP.
2. Booth, L, Diana, 2014 *Project Work*, OUP, Oxford.
3. Shoba and Praveen Sam 2018, *Technical English-Workbook*, Cambridge University Press: New Delhi.
4. Ibbotson & Mark 2009, *Professional English in use*, University Press, New Delhi,
5. Sudharshana, NP & Shavitha, C 2018, *English for Engineers*, Cambridge University Press, Chennai.

WEB SOURCES:

1. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/index.html
2. <https://hbr.org/topic/communication>

CO4: Evaluate integrals using Cauchy's integral formula and residue theorem.

CO5: Apply Laplace transforms techniques in solving differential equations.

TEXT BOOKS:

1. Grewal, BS 2014, *Higher Engineering Mathematics*, Khanna Publishers, 43rd Edition, New Delhi.
2. Kreyszig Erwin 2016, *Advanced Engineering Mathematics*, John Wiley and Sons, 10th Edition, New Delhi.

REFERENCES :

1. Bali, N, Goyal, M & Watkins, C 2009, *Advanced Engineering Mathematics*, Firewall Media, 7thed, New Delhi.
2. Jain, RK&lyengar, SRK 2007, *Advanced Engineering Mathematics*, Narosa Publications, 3rded, New Delhi.
3. Wylie, RC & Barrett, LC 2012, *Advanced Engineering Mathematics*, Tata McGraw Hill Education Pvt. Ltd, 6thed, New Delhi.
4. Peter V. O'Neil 2007, *Advanced Engineering Mathematics*, Cengage learning, 7thed.
5. Weir, MD & Joel Hass 2016, *Thomas Calculus*, Pearson Education, 12thed, India.

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OBJECTIVES:

- To impart knowledge on the important principles and properties of materials to Mechanical engineering, Mechatronics engineering and Polymer technology students.

UNIT I PHASE DIAGRAMS 9

Solid solutions - Hume Rothery's rules – the phase rule - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions.

UNIT II ELASTIC PROPERTIES OF MATERIALS 9

Stress-strain diagram - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform bending method – I-shaped girders.

UNIT III MECHANICAL PROPERTIES OF MATERIALS 9

Tensile test - plastic deformation mechanisms - slip and twinning - Role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - fracture - the Griffith criterion - critical stress intensity factor and its determination-fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

UNIT IV MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Neel's temperature - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses.

UNIT V NEW MATERIALS 9

Metallic glasses - shape memory alloys – Nanomaterials preparation techniques: Bottom up: Sol-gel synthesis, CVD, PVD techniques and top down: Mechanical milling, Laser ablation approaches, properties and applications of nanomaterials - Conducting polymers, Bio-polymers and high temperature polymers.

TOTAL: 45 PERIODS

COURSE OUTCOME:

Upon completion of this course, Students will be able to

CO1: Summarize the various phase diagrams and their applications.

CO2: Describe the elastic properties of materials.

CO3: Demonstrate the mechanical properties of materials and their measurement

CO4: Classify the different types of magnetic materials.

CO5: Explain the basics of new materials and nanomaterials with their preparation techniques.

TEXT BOOKS:

1. Balasubramaniam, R 2014, *Callister's Materials Science and Engineering*, Wiley India Pvt. Ltd.
2. Charles Kittel 2019, *Introduction to Solid State Physics*, 8th ed, John Wiley and Sons, Singapore.
3. Raghavan, V 2015, *Materials Science and Engineering: A First course*, PHI Learning.

REFERENCES:

1. Askeland, D 2010, *Materials Science and Engineering*, Brooks/Cole.
2. Smith, WF, Hashemi, J & Prakash, R, *Materials Science and Engineering*, Tata McGraw Hill Education Pvt. Ltd.
3. Wahab, MA 2009, *Solid State Physics: Structure and Properties of Materials*, Narosa Publishing House
4. Pradeep, T 2007, *NANO: The Essentials: Understanding Nanoscience and Nanotechnology*, McGraw-Hill education.
5. Van Vlack, LH 1989, *Elements of Materials Science and Engineering*, 6th ed, Addison Wesley.

WEB REFERENCES:

1. <https://nptel.ac.in/courses/112/108/112108150/>(Phase diagram, Mechanical Properties, Magnetic Properties)
2. <https://nptel.ac.in/courses/122/102/122102008/>(Phase transformations, Strengthening mechanisms, Creep & Fracture)
3. <https://www.youtube.com/watch?v=Z51R49OOqAA>(Synthesis of Nanomaterial)
4. <https://nptel.ac.in/courses/105/108/105108070/>(Elastic properties of Materials)

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OBJECTIVES:

To enable the students to understand

- The interrelationship between living organism and environment.
- The integrated themes and biodiversity, natural resources, pollution control and waste management.
- Scientific, technological, economic and political solutions to environmental problems.
- The dynamic processes and understand the features of the earth's interior and surface
- The importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES, ECOSYSTEM AND BIODIVERSITY 12

Definition, scope and importance, need for public awareness - Environment- Concept of ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- Energy flow in the eco system - Food chain, Food web -Ecological pyramid- Ecological Succession - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries - Introduction to biodiversity definition: genetic, species and ecosystem diversity - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values - India as a mega diversity nation – Hotspots of Biodiversity - endangered and endemic species of India- Threats to Biodiversity (habitat loss, poaching, man-wildlife conflicts) -conservation of biodiversity: In-situ and ex-situ – Field study.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: (a) Air pollution (climate change, global warming, acid rain, ozone layer depletion) (b) Water pollution (c) Noise pollution (d) Marine pollution (e) Nuclear Pollution (f) Soil Pollution - Solid waste management- causes, effects and control – e-waste - Role of an individual in prevention of pollution - Pollution case studies

UNIT III NATURAL RESOURCES 9

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Rain water harvesting - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion - Land resources: Land as a resource, land degradation, man induced landslides, soil - role of an individual in conservation of natural resources.

UNIT IV DISASTER MANAGEMENT AND ENVIRONMENTAL LEGISLATIONS 9

Definition of disaster – types – Natural disasters – Earthquakes – Landslides – Flood, cyclones, Tsunami and Drought Man made disaster – Nuclear, Chemical and Biological disaster (COVID-19) – Disaster impacts (Environmental, Physical, social, ecological and economical) – Case study – Need and concept of disaster management – Disaster management cycle – Mitigation , relief – recovery –Role and responsibility of the government, community, local institutions and NGO's - Environmental ethics – Acts for prevention of environmental pollution – Wild life protection act –

Forest conservation act –Water (Prevention & control) Act – Air (Prevention & control) Act – Environmental protection Act – Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – population explosion – family welfare programme – Resettlement and rehabilitation of people – human rights – value education - HIV / AIDS- women and child welfare - Environmental impact analysis (EIA)- -GIS-remote sensing- role of information technology in environment and human health – Case studies

TOTAL: 45 PERIODS

OBJECTIVES:

Upon successful completion of course the students will be able to

CO1: Explain the natural environment and its relationships with human activities.

CO2: Summarize the causes, effects and control measures of various environmental pollution.

CO3: Illustrate the importance of various resources, its utilization and conservation

CO4: Infer that the technological development and improvement in standard of living lead to serious environmental disasters.

CO5: Outline the importance of population control and its impact on the environment.

TEXT BOOKS:

1. Bharucha, E, 2013, *Textbook of Environmental studies for Undergraduate Courses*, 2nded, Universities Press Pvt. Ltd.
2. Benny Joseph, 2017, *Environmental Science and Engineering*, 3rded, Tata McGraw-Hill, New Delhi.
3. Miller, TG &Jr, Spoolman, S, 2014, *New Environmental Science*, 14thed, Wadsworth Publishing Co, New Delhi.

REFERENCES:

1. Kaushik, A &Kaushik, CP 2018, *Environmental Science and Engineering*, 6thed, New Age International private Ltd, New Delhi.
2. Gilbert Masters & Wendell, PEla, 2013, *Introduction to Environmental Engineering and Science*, 3rded, Pearson Education private Ltd.
3. De, AK 2014, *Environmental Chemistry*, 7thed, New Age international publishers, New Delhi.
4. Sawyer, CN, Mac Carty, PL, &Parkin, GF 2003, *Chemistry for Environmental Engineering and Science*, 5thed, Tata McGraw – Hill, New Delhi.

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OBJECTIVES:

To enable the students to

- Develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- Expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning, Isometric projection of combination of solids

UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACE (3+12)

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object

UNIT II PROJECTIONS OF SOLIDS (3+12)

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT III PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES (3+12)

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT IV ISOMETRIC AND PERSPECTIVE PROJECTIONS (3+12)

Principles of isometric projection – isometric scale -isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - Perspective projection of simple solids- Prisms, pyramids and cylinders by visual ray method .

UNIT V ORTHOGRAPHIC PROJECTION (3+12)

Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid — Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of ThreeDimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects simple objects. Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Drawing of tangents and normal to the above curves

TOTAL: 75 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

- CO1: Familiarize with the fundamentals and standards of Engineering graphics
- CO2: Perform freehand sketching of basic geometrical constructions and multiple views of objects.

- CO3: Project orthographic projections of lines and plane surfaces
CO4: Draw projections and solids and development of surfaces
CO5: Visualize and to project isometric and perspective sections of simple solids.

TEXT BOOKS:

1. Natarajan, KV 2006, *A text book of Engineering Graphics*, Dhanalakshmi Publishers, Chennai.
2. Venugopal K &Prabhu Raja V 2008, *Engineering Graphics*, New Age International (P) Limited.

REFERENCES:

1. Bhatt ND & Panchal VM 2010, *Engineering Drawing*, 50thed, Charotar Publishing House.
2. Basant Agarwal & Agarwal CM 2008, *Engineering Drawing*, Tata McGraw Hill PublishingCompanyLimited,NewDelhi.
3. Gopalakrishna KR 2007, *Engineering Drawing (Vol. I&II combined)*, Subhas Stores, Bangalore.
4. Luzzader, Warren.J. &Duff,John M2005, *Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production*, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi.
5. N S Parthasarathy& Vela Murali 2015, *Engineering Graphics*, Oxford University, Press, New Delhi.
6. Shah MB &Rana BC2009, *Engineering Drawing*, 2nded Pearson.

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OBJECTIVES:

To enable the students

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I BASICS AND STATICS OF PARTICLES 9

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces - Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components -Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility

UNIT II EQUILIBRIUM OF RIGID BODIES 9

Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9

Centroid and Moment of Inertia – Centroid of lines and areas – Theorems of Pappus - Parallel axis theorem and perpendicular axis theorem for Second moment of Plane area - First and Second moment of plane area , Principal Moment of Inertia for T section- I section, - Angle section, Hollow section by using standard formula.Mass moment of Inertia for prismatic, cylindrical and spherical solids - Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION 9

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction-. Rolling resistance

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

- CO1: Apply basic engineering principles such as laws of mechanics and vector calculus for solving problems related to particles at rest.
- CO2: Examine the various reactive forces and couples for equilibrium of rigid bodies using free body diagram.
- CO3: Determine the various section properties (Centroid, Moment of Inertia, Product Moment of Inertia and Mass moment of Inertia) for simple and composite sections.
- CO4: Solve simple application problems related to dynamics of particles (velocity, acceleration, forces that induce motion and work done).
- CO5: Calculate the frictional forces exerted when a body is sliding & Rolling over another body.

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R., (2004), *Vector Mechanics for Engineers (In SI Units): Statics and Dynamics*, 8th ed, Tata McGraw-Hill Publishing company,
2. Vela Murali, 2010, *Engineering Mechanics*, Oxford University Press

REFERENCES:

1. Bhavikatti, S.S and Rajashekarappa, K.G, 1998, *Engineering Mechanics*, New Age International (P) Limited Publishers,
2. Hibbeler, R.C and Ashok Gupta, 2010, *Engineering Mechanics: Statics and Dynamics*, 11th Edition, Pearson Education
3. Irving H. Shames and Krishna Mohana Rao. G., 2006, *Engineering Mechanics – Statics and Dynamics*, 4th ed, Pearson Education.
4. Meriam J.L. and Kraige L.G., 1993, *Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2*, 3rd ed, John Wiley & Sons.
5. Rajasekaran S and Sankarasubramanian G., 2005, *Engineering Mechanics Statics and Dynamics*, 3rd ed, Vikas Publishing House Pvt. Ltd.

GE1281

ENGINEERING PRACTICES LABORATORY
(Common to all branches of B.E./ B.Tech Programmes)

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OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 12

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:
 - i. Wood work, joints by sawing, planning and cutting

II MECHANICAL ENGINEERING PRACTICE 18

Welding:

(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:

(b) Model making – Trays and funnels.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner
- (c) Study of 3D Printing

Group –B (Electrical & Electronics)

III ELECTRICAL ENGINEERING PRACTICE 14

- 1. Residential wiring using switches, fuse, indicator, lamp and energy meter.
- 2. Fluorescent lamp wiring.
- 3. Stair case wiring
- 4. Measurement of energy using single phase energy meter.
- 5. Measurement of electrical quantities – voltage, current, impedance, power & power factor in RLC circuit.
- 6. Measurement of resistance to earth of electrical equipment.
- 7. Study of UPS
- 8. Study of Protective Devices- Fuses, Circuit Breakers & Relays

IV ELECTRONICS ENGINEERING PRACTICE 16

- 1. Study of Electronic components and equipments, Resistor color coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO.
- 2. Study of logic gates AND, OR, EX-OR and NOT.
- 3. Generation of Clock Signal.
- 4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
- 5. Measurement of ripple factor of HWR and FWR.
- 6. Study of Mixed Storage Oscilloscope

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon successful completion of course the students will be able to

- CO1: Fabricate carpentry components and pipe connections including plumbing works.
- CO2: Use welding equipment to join the structures
- CO3: Make the models using sheet metal works
- CO4: Demonstrate various electrical switches and wiring.
- CO5: Measure the various electrical quantities.
- CO6: Elaborate on the components, gates, soldering practices

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

- 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.

15 Sets.

2. Carpentry vice (fitted to work bench)	15 Nos.
3. Standard woodworking tools	15 Sets.
4. Models of industrial trusses, door joints, furniture joints	5 each
5. Power Tools: (a) Rotary Hammer	2 Nos
(b) Demolition Hammer	2 Nos
(c) Circular Saw	2 Nos
(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos
(f) Jigsaw	2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner, 3D Printer	One each

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

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OBJECTIVES:

To enable the students to,

- Understand drawing standards, Fits and Tolerances
- Prepare drawings using standard CAD packages
- Draw orthographic projection of simple objects
- Create isometric projections of simple solids

LIST OF EXERCISES USING SOFTWARE CAPABLE OF DRAFTING

- 1) Study of Code of Practice for Engineering Drawing, BIS specifications – welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys, etc.
- 2) Study of limits, fits – Tolerancing of individual dimensions – Specification of fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & Tolerancing.
- 3) Study of capabilities of software for Drafting– Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
- 4) Drawing of a Title Block with necessary text and projection symbol.
- 5) Drawing of curves like parabola, spiral, involute of square & circle.
- 6) Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
- 7) Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixer, Simple stool, Objects with hole and curves).
- 8) Drawing of a simple steel truss.
- 9) Drawing sectional views of prism, pyramid, cylinder, cone, etc,
- 10) Drawing isometric projection of simple objects.

TOTAL: 60 PERIODS

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

COURSE OUTCOMES

Upon successful completion of course the students will be able to

- CO1: Sketch simple figures using CAD software
- CO2: Sketch curves like parabola, spiral and involute of square & circle
- CO3: Prepare orthographic projection of simple solids
- CO4: Sketch simple steel truss and sectional views of simple solids.
- CO5: Prepare isometric projection of simple objects.

TEXT BOOKS:

1. Narayana, K.L., 2016, *Machine drawing*. New Age International.

REFERENCES:

1. Reddy, K.V., 2008, *Textbook of engineering drawing*. BS Publications.

2. Simmons, C.H. and Maguire, D.E., 2012, *Manual of engineering drawing: Technical product specification and documentation to British and International Standards*. Butterworth-Heinemann.
3. Onstott, S., 2014, *AutoCAD 2015 and AutoCAD LT 2015 Essentials: Autodesk Official Press*. John Wiley & Sons.
4. Morling, K., 2010, *Geometric and engineering drawing*. Routledge.
5. Shah, M.B., 2006, *Engineering Drawing*. Pearson Education India.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity
1.	Pentium IV computer or better hardware, with suitable graphics facility	30 No.
2.	Licensed software for Drafting	30 Licenses
3.	Laser Printer or Plotter to print/plot drawings	2 No.