Department of Electronics and Communication Engineering

Subject: Introduction to Electronics Engineering (IEE)

Regulation Year: 2020-2021

Course Code: **ECE1001** **Credit: 3**

Course Category: **Engineering Science (ESC)** **Contact hours: 42**

Recommended Prerequisites:

Course Outcomes :After successful completion of the course, the student will be able to

CO1 *Design simple logic circuits by using the concept of number systems, logic gates, numeric codes, and Boolean algebra minimization*

CO2 *Apply the concept of working principle of diode(s) in the Rectifiers, Clippers, Clampers, Voltage Regulator, and LED circuits*

CO3 *Analyze simple amplifier circuits using the concept of BJT, JFET, and its Biasing*

CO4 *Apply the concept of OP-AMP, and its characteristics in inverting, non-inverting, summing, and subtractor circuits*

CO5 *Understand the operations of CRO/DSO, multi-meter, Function Generator in measurement, and generation of different signals.*

Course Details

Unit 1
Number System and Logic Gates **(10 Hrs)**

Basics of Number System, its Conversion, Compliments, and mathematical Operations, Boolean algebra, Basic Logic gates.

Unit 2
Semiconductor Diode and its Applications **(11 Hrs)**

PN junction diode Operation, and characteristics, Diode applications: rectifiers, clamper, clipper, Voltage regulator, LED, Schottky diodes

Unit 3
Bipolar Junction transistor **(07 Hrs)**

Bipolar Junction Transistor: Construction, Operation and characteristics, transistor biasing circuits, and stabilization analysis

Unit 4
Field Effect Transistor **(05 Hrs)**

Construction and principle of working of JFET, Drain / Transfer characteristics, Biasing of JFET

Unit 5
Operational Amplifier and Instruments **(09 Hrs)**

Operational Amplifier and its various applications. Electronic Instruments: Digital Multi-meter, CRO, Spectrum analyzer, DSO.

Text Books:

T1. "Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky, Pearson Education, 11th Edition, 2013.

T2. "Microelectronics Circuit" Adel S. Sedra and Kenneth C. Smith, Oxford University Press, 6th Edition, 2013.

T3. "Digital Fundamentals", Thomas L. Floyd, Pearson Education, 11thEdition, 2015.

Reference Books:

R1. "Integrated Electronics: Analog and Digital Circuit", Jacob Millman, Christos Halkias and Chetan D Parikh, Mcgraw Hill Education, 2nd Edition, 2011.

R2. "Digital Design", M Moris Mano, Michael D. Ciletti, Pearson Education, 4th Edition, 2011.

R3 " Principles of Electronics", V K Mehta, S. Chand & Company, New Delhi, 12th Edition

Open Sources

OS1. COURSERA - Introduction to Electronics - Dr. Bonnie H. Ferri, and Dr.Allen Robinson, School of Electrical and Computer Engineering, Georgia Institute of Technology
https://www.coursera.org/learn/electronics

OS2. NPTEL - Basic Electronics - Video course - Prof. Chitralekha Mahanta, Department of Electronics and Communication Engineering, IIT Guwahati
https://nptel.ac.in/courses/117/103/117103063/#

OS3. NPTEL – Digital Circuits - Video course - PROF. Santanu Chattopadhyay, Department of Electrical Engineering, IIT Kharagpur
https://nptel.ac.in/courses/108/105/108105113/

Department: Chemistry

Subject: Engineering Chemistry

Regulation Year: 2020-21

Course Code: CHY1001 **Credit: 3**

Course Category: Basic Science (BSC) **Contact hours: 42**

Recommended Pre-requisite: NIL

COURSE OUTCOMES:

CO1: *Determine the stability, bond order and magnetic property of diatomic molecules including O_2, N_2, H F and understand the coordination complexes*

CO2: *Calculate phases, components and degree of freedom in single and bi-component system using phase diagram. Calculate density, cell parameters, molecular mass of metals and metal oxides*

CO3: *Calculate enthalpy, heat of combustion, entropy based on Hess's law and Born Haber's cycle*

CO4: *Understand the application of laws of UV-Visible and IR spectroscopy in analytical Chemistry*

CO5: *Calculate the EMF of electrochemical cell, establish the relationship of EMF with various thermodynamic parameters, and determine the pH through EMF measurement*

Course Details:

Unit 1: Structure and Bonding

Schrödinger equation, interpretation of wave functions, molecular orbital theory of diatomic molecules, nomenclature and isomerism in coordination complex. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties

Unit 2: Phase rule and Solid State

Phase diagram of one & two component systems, H_2O, S and Bi- Cd systems. Crystal systems, Bravais lattices, ionic solids, and crystal defects including Schottky and Frenkel defects

Unit 3: Thermodynamics

Thermo chemistry, thermo-chemical calculations based on Hess's law and Born-Haber cycle, second law of thermodynamics, entropy, the free energy concepts, applications to gases, Gibbs Helmholtz equation, free energy change and criterion of spontaneity and Maxwell's relations.

Unit 4: Spectroscopy

Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, Applications on quantitative analysis. Absorption by aromatic systems

Unit 5: Electrochemistry

Electrochemical cells, EMF, Measurement of EMF, Relation between EMF & free energy change of cell reactions, Electrode potentials and measurements with reference to standard hydrogen electrode, calomel electrodes, determination of pH, dry cells, storage cells and fuel cells

Text Books (minimum 3):

T1. "Engineering Chemistry", P. C. Jain and M. Jain, Dhanpat Rai publishing company (P) Ltd. New Delhi, 16th Edition, 2013.
T2. "Physical Chemistry" G.M. Barrow, Tata Mc-Graw Hill Edition, New Delhi, 5th Edition, 1992.
T3. "Fundamental of Molecular Spectroscopy", C.N. Banwell and E.M. McCash, Tata McGraw-Hill Education, 4th Edition, 1994.

Reference Books (minimum 2)
R1. "Selected topics in Inorganic Chemistry" W.U. Malik, G.D. Tuli and R.D. Madan, S. Chand & Company Ltd, New Delhi, 17th Edition, 1976.
R2. "Principle of Physical Chemistry", B.R. Puri, L.R. Sharma, M.S. Pathania, Vishal Publishing Co., 46th Edition, 2013
R3. "Atkins Physical Chemistry", P. Atkins, J. Paula, Oxford University Press, 10th Edition, 2014

Open Sources:
A. NPTEL Course

1. Fundamentals of Spectroscopy: (https://swayam.gov.in/nd1_noc20_cy08/preview)

2. Basics in Inorganic Chemistry: (https://swayam.gov.in/nd1_noc20_cy03/preview)

3. AdvancedChemical Thermodynamics and Kinetics:
https://swayam.gov.in/nd1_noc20_cy09/preview

B: COURSERA Course
1. Introduction to Physical Chemistry (https://www.coursera.org/learn/physical-chemistry)
2. Introduction to Molecular Spectroscopy (https://www.coursera.org/learn/spectroscopy)
3. Introduction to Chemistry: Reactions and Ratios (https://www.coursera.org/learn/intro-chemistry)
4. Chemistry (https://www.coursera.org/learn/chemistry-1)

Department: Chemistry

Subject Name: Engineering Chemistry Laboratory

Regulation Year: 2020-21

Course Code: CHY1101 **Credit: 02**

Course Category: Basic Science (BSC) **Contact hours: 30**

Recommended Pre-requisite: NIL

COURSE OUTCOMES:

CO1*: Calculate the amount of total hardness, chlorine and dissolved oxygen present in water*

CO2: *Determine the amount of NaOH, Na_2CO_3, Fe(II) and Ca in solution.*

CO3: *Measure viscosity, flash point and fire point of oil.*

CO4: *Calculate pH of buffer solution*

Experiment Details:

Experiment No. 1: Estimation of hardness in water sample.

Experiment No. 2: Determination of percentage of available chlorine in water/bleaching powder sample.

Experiment No. 3: Determination of dissolved oxygen in water.

Experiment No. 4: Determination of amount of sodium hydroxide and sodium carbonate in a mixture.

Experiment No. 5: Determination of Ferrous iron in Mohr's salt by potassium permanganate.

Experiment No. 6: Standardization of potassium permanganate using primary standard

Experiment No. 7: Determination of Kinematic Viscosity of lubricating oil by Redwood viscometer.

Experiment No. 8: Determination of flash point of given oil by Pensky Marten's flash point apparatus.

Experiment No. 9: Verification of Beer-Lamberts Law and determination of concentration of a coloured substance by spectrophotometer

Experiment No. 10: Estimation of Calcium in limestone.

Experiment No. 11: Determination of pH of buffer solution.

Experiment No. 12: Preparation of Urea Formaldehyde

Experiment No. 13: Preparation of Aspirin.

NOTE: Out of the 13 experiments, At least 10 numbers of experiments will be performed in a semester.

Open Sources/Virtual lab:

1. https://www.vlab.co.in/broad-area-chemical-sciences

Reference Book

"Vogel's Textbook of Quantitative Chemical analysis" Revised by G. H. Jeffery, J. Bassett, J. Mendham & R. C. Denney, 5/E, ELBS (English Language Book Society) Longman.

Department of Electrical Engineering

Subject Name: Basic Electrical Engineering

Regulation Year: 2020-2021

Course Code: ELE1001 **Credit: 3**

Course Category: Engineering Science (ESC) **Contact hours: 42 Hrs**

Recommended Pre-requisite: Basic Sciences

COURSE OUTCOMES:

CO1: *Understand the basic principles of network fundamentals and theorems with DC excitation and their application.*

CO2: *Understand the basic principles of alternating current and their applications for computation of responses like voltage, current and power.*

CO3: *Apply the concept of magnetic circuits in understanding the basic knowledge of transformers.*

CO4: *Acquire knowledge about constructional details and principle of operations of different rotating machines.*

CO5: *Introducing the components of low voltage electrical installation.*

Course Details:

Unit 1: DC Circuits (8 hours)
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems .Time-domain analysis of first-order RL and RC circuits.

Unit 2: AC Circuits (10 hours)
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L,C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits,voltage and current relations in star and delta connections.

Unit 3: Transformers (6 hours)
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses intransformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit 4 : Electrical Rotating Machines (10 hours)

DC Motor: Construction, working, torque-speed characteristic and speed control of dc motor, Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Introduction to single-phase induction motor and synchronous machines.

Unit 5 : Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Text Books :

1. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill Publication, 2009.
2. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill Publication, 2010.
3. E. Hughes, “Electrical and Electronics Technology”, Pearson Publication, 2010.

Reference Books :

1. T.K. Nagsarkar& M.S. Sukhija, “Basic Electrical Engineering”, Oxford,2nd Edition 2011.
2. B. L. Theraja& A. K. Theraja, “A Textbook of Electrical Technology, Volume 1 & Volume 2”, S. Chand Publication, 2009.
3. V.D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India Publication, 1989.

Open Sources:

1. Dr. Nagendra Krishnapura, “Basic Electrical Circuits”, NPTEL - IIT Madras. https://nptel.ac.in/courses/108/106/108106172/
2. Prof. L. Umanand, “Basic Electrical Technology”, NPTEL – IISC Banglore. https://nptel.ac.in/courses/108/108/108108076/

Department of Electrical Engineering

Subject Name: Basic Electrical Engineering Laboratory

Regulation Year: 2020-2021

Course Code: ELE 1101 **Credit:** 2

Course Category: Engineering Science (ESC) **Contact hours:** 30

Recommended Pre-requisite: Basic Sciences

COURSE OUTCOMES:

CO1: *Get an exposure to common electrical components and their ratings.*

CO2: *Make electrical connections by wires of appropriate ratings.*

CO3: *Understand the usage of common electrical measuring instruments.*

CO4: *Acknowledge the principles of operation and the main features of electric machines and their applications.*

Experiment Details:

Experiment 1: Measurements of resistance, current, voltage and electric power in (a) Series (b) Parallel connection of resistors with D.C excitation (c) Series-Parallel Combination.

Experiment 2: Verification of superposition theorem.

Experiment 3: Verification of Thevenin's and Norton's theorem.

Experiment 4: Calculation of current, voltage, power and power factor in series and parallel R-L-C circuit excited by single-phase AC supply.

Experiment 5: Study of three phase balanced & unbalanced star / delta circuits.

Experiment 6: Study and analysis of B-H curve of ferromagnetic material.

Experiment 7: To study and find out internal resistance and specific gravity of lead acid cells/batteries.

Experiment 8: Connection and measurement of power consumption and power factor of a fluorescent lamp.

Experiment 9: Study of fusing characteristics of a fuse.

Experiment 10: Determination of efficiency by open-circuit and short-circuit test on single-phase transformer.

Experiment 11: Polarity test and parallel operation of two single-phase transformers.

Experiment 12: To study how to reverse the direction of rotation in a 3-phase induction motor.

Experiment 13: To study torque-slip characteristics of a 3-phase induction motor.

Experiment 14: To study torque-speed characteristics of DC shunt motor.

Experiment 15: Speed Control of DC shunt motor by armature control and flux control method.

Open Sources/Virtual lab:

1. http://vlab.amrita.edu/?sub=1&brch=75
2. http://vlabs.iitkgp.ernet.in/asnm/#

Department of Chemical Engineering

Subject Name: Basic Thermodynamics

Regulation Year: 2020-21

Course Code: CHE1001 **Credit: 3**

Course Category: Engineering Science (ESC) **Contact hours: 42**

Recommended Pre-requisite: Basic knowledge of physics, Chemistry & Mathematics

COURSE OUTCOMES:

CO1: *Understand about thermodynamic systems (Open, Closed and Isolated), Apply P-V-T relations for ideal gases and mixture of gases.*

CO2: *Analyze the Isobaric, Isochoric, Isothermal, Adiabatic and Polytropic processes, Apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger etc.) to estimate required balances of heat, work and energy*

CO3: *Apply the Second Law of Thermodynamics and relating the concepts to the Heat engine, Refrigerator and Heat pump.*

CO4: *Determine the properties (Pressure, Temperature, Sp. Volume, Enthalpy, Entropy etc.) of pure substance with the help of steam table.*

CO5: *Apply the concepts of thermodynamics to real life applications (Air compressors, Steam power plant, Refrigerators and Heat pump, I.C. Engines etc.)*

Course Details:

Unit 1: Concepts, Ideal Gas and Properties of Gas Mixtures: (10Hrs.)

U1.1. Scope of Thermodynamics, Macroscopic and Microscopic approaches; Definition of Fixed mass (closed systems) and Control volume(open system), Properties (extensive and Intensive), State and its representation on a property diagram, Process and its representation, Cyclic process (or cycle) and its representation, Characteristics of properties (point and path function);Reversible and Irreversible processes; Thermal, mechanical and Chemical equilibrium, Thermodynamic equilibrium, Zeroth Law of Thermodynamics and temperature, Measurement of temperature and calibration of thermometers, the ideal gas temperature scale,

Measurement of pressure, gauge and absolute pressure, Bourdon pressure gage and U-tube manometers, Ideal gases and their P-V -T relations, Gas mixtures

U1.2. Temperature scale problem, gas laws.

Unit 2: **Energy Transfer and First Law of Thermodynamics: (08Hrs.)**

U2.1. Work Transfer (definition and calculation), Different modes of work, Displacement Work for various process, Heat Transfer; Modes of heat transfer, Basic laws in conduction, convection and radiation, combined modes of heat transfer with examples. Formal statement of First law (using cyclic processes for a closed systems) and introduction of internal energy as a thermodynamics property, Introduction of enthalpy as a thermodynamic property; Definition of specific heats and their use in calculation of internal energy and enthalpy with emphasis on ideal gages. Application of First Law to control volumes; Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger. (Only steady flow need to be considered).

U2.2. Problem on different modes of work transfer, Problems on Conduction, Convection and Radiation

Unit 3: **Second Law of Thermodynamics: (08Hrs.)**

U3.1. Kelvin- Planck and Clausius statements of Second Law, Reversibility and irreversibility, Carnot cycle, Reverse Carnot cycle, Carnot theorem, Absolute temperature scale, Definition of entropy, Clausius theorem, Clausius Inequality, Entropy Principle and applications.

U3.2. Third law of thermodynamics, Problems on Entropy.

Unit 4: Kinematics of Particles: (08Hrs.)

U4.1. P-v, T-v, P-T, T-s, h-s diagram for steam, different types of steam, Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy.

U4.2. P-v-T Surface, Vapour Pressure.

Unit 5: Kinetics of Particles: **(08Hrs.)**

U5.1. Air compressors, steam power plant, Refrigerators and Heat pump, I.C. Engines (Brief Description of different components of above mentioned systems and working principles with Schematic diagram only)

U5.2. Rotary Compressors.

Text Books

T1. "Engineering Thermodynamics", P K Nag,Tata McGraw Hill, 5th Edition, 2013.

T2. "Thermodynamics: An Engineering Approach", Yunus A. Çengel and Michael A. Boles, McGraw Hill, 7th Edition, 2011.

T3. "Fundamental of Engineering Thermodynamics", E. Rathakrishnan, PHI, 2nd Edition, 2005.

Reference Books

R1. "Engineering Thermodynamics" Van Wylen and Sontang, John Wiley, 7th Edition, 2009.

R2. "Engineering Thermodynamics", P. Chattopadhyay, Oxford University Press, 1st revised Edition, 2011.

R3. "Steam Tables" K K Ramalingam, Scitech, 1st Edition, 2009.

R4. "Engineering Thermodynamics", M.Achuthan, PHI, 2nd Edition, 2009

Open Sources:

NPTEL, COURSERA

Department of Computer Science and Engineering

Subject Name: Computer Programming

Regulation Year: 2020-21

Course Code: CSE1001 **Credit: 03**

Course Category: Engineering Science (ESC) **Contact hours: 42 Hrs**

Recommended Pre-requisite: Knowledge of computer fundamentals. Knowledge of basic mathematics.

COURSE OUTCOMES:

CO1: *Develops basic understanding of algorithmic thinking and syntax writing of C program.*

CO2: *Develop conditional, loop and iterative statements to write C programs.*

CO3: *Exercise user defined functions to solve real time problems.*

CO4: *Create a C Program that uses Pointer to access array, string and functions.*

CO5: *Apply structure and file handling concept to develop C program.*

Course Details:

Unit 1: Introduction to Programming: **(8 Hrs)**

U1.1. Basic functional units of a computer and their utility. Problem solving using computers and logic design. Algorithms and their representations: flowcharts, pseudo code. Designing algorithms. Efficient algorithm writing techniques. Concept of programming languages for implementing algorithms – levels of languages. Role of assemblers, compilers, linker, loader, interpreter in program execution.

U1.2. Introduction to C: “Hello World” in C – editor, compiler, execution environment. C as a middle level language. Basic structure of C program, standard library and header files, Syntax and Semantics. Input-output statements, Formatted input/output statements. Variable, constant (literal and named), Data types, variable declaration. Assignment. Operators: Arithmetic, logical, relational, Expressions, Precedence & Associativity. Input and output statements, escape sequences.

Unit 2: Flow of Control: **(8 Hrs)**

U2.1. Selection Statement: if, nested if –else, Conditional Expression, Switch statements. Iteration Statements: for loop, while loop, do -while loop, nested loop. Statements: go to, break & continue. Common programming errors. Application of C constructs in solving problems like generating arithmetic and geometric progression.

U2.2.

U2.3. Arrays: Concept, declaration and initialization of arrays, accessing individual elements of

array. Use of arrays in sorting, searching. Concept of 2-D array (Matrix), row major and column major representation of array, address calculation for accessing the individual element. Stack and Queue.

Unit 3: Functions: (8 Hrs)

U3.1. Need of functions, function declaration, definition and call. In-built functions and user defined functions. Passing arguments to a function, returning values from a function. Scope of variable, local and global variable. Access specifiers. Passing arrays to functions.

U3.2. Recursive Functions: Need of Recursion, direct recursion, indirect recursion, impact of recursion on local& global variables, examples of recursive programs – factorial, progressions, towers of Hanoi. Recursive vs Iterative solutions. Disadvantages of recursion.

Unit 4: Pointers & Strings: (8 Hrs)

U4.1. Concept of pointers, relevance of data type in pointer variable, pointer arithmetic. Pointer to pointer. Pointers and functions (passing pointers to functions, returning pointers from functions). Pointers and arrays. Constant Pointer. Array of pointers, pointer to an array. Accessing an array using pointers.

U4.2. Strings: Strings as arrays, character array versus strings, reading and writing strings, String handling functions, user defined functions for string operations – copy, concatenate, length, reverse, converting case, appending, comparing two string, extracting a substring. Pointers and strings. Array of strings.

Unit 5: Structures & File Handling in C: (8 Hrs)

U5.1. Structures: Declaration and initialization, structure variables, accessing and assigning values of the fields, "size of" operator, functions and structures, array of structures, nested structures, pointers and structures, passing structure to a function and returning structure from function. Dynamic memory allocation, type casting, Introduction to self referential structures, Linked List.

U5.2. File Handling in C: file types, file opening modes, file handling I/O – fprintf, fscanf, fwrite, fread, fseek. File pointers. Implementing basic file operations in C.

Text Books :

1. “Programming language – ANSI C”, Brain W Kernighan and Dennis Ritchie, Second edition ISBN 0-13-110370-9, 2018.
2. “C Programming”, Balagurusamy, Tata McGraw-Hill.
3. “Programming with C- Schaum’s outline Series”, B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7.

Reference Books

1. “A first book of C- Fundamental of C Programming”, Gary Bronson and Stephen Menconi, ISBN: 0314073361
2. “Computer fundamentals and Programming in C”, Reema Thareja, Oxford University Press, ISBN:0-19-807888-9.
3. “Let us C”, Y. Kanetkar, Second Edition, BPB Publication. ISBN: 8176566217.

Open Sources:

1. https://nptel.ac.in/courses/106/104/106104128/ (Introduction to Programming in C)
2. https://nptel.ac.in/courses/106/105/106105171/ (Problem solving through Programming in C)

Department of Computer Science and Engineering

Subject Name: Computer Programming Lab

Regulation Year: 2020-21

Course Code: CSE1101 **Credit: 02**

Course Category: Engineering Science (ESC) **Contact hours: 30** Hrs

Recommended Pre-requisite:

Basic knowledge to handle a computer system. Basic knowledge of Linux and Windows Operating System.

COURSE OUTCOMES:

CO1: *Understand basic structure of the C programming, declaration and usage of variables.*

CO2: *Exercise conditional and iterative statements to Write C programs*

CO3: *Apply the in-built functions and customized functions of string for solving the problems.*

CO4: *Write C programs using Pointers to access arrays, strings and functions.*

CO5: *Exercise user defined data types of the C programming.*

Experiment Details:

Experiment 1
Study of important DOS/UNIX commands.

Experiment 2
Write a program in C to find largest element, average of given N elements, sum and reverse of a given integer.

Experiment 3
Write a program in C to implement a simple mathematical calculation

Experiment 4
Write a program in C to read an integer and display each of the digits of an integer in English.

Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Experiment 5
Write a program in C to perform Addition / Subtraction / Multiplication of two Matrices. Also determine whether the matrix is symmetric / skewed.

Experiment 6
Write a program in C to carry out following operations on strings using string library

a. Length of a sting

b. Copy a string.

c. Concatenation of strings.

Experiment 7
Write a program in C to carry out following operations on strings without using string library functions

a. Compare two strings.

b. Reverse given string.

c. To check if the given string is a palindrome or not.

Experiment 8
Write a program in C to carry out following operations on strings using pointers.

a. Length of a sting.

b. Concatenation of strings.

c. Copy of string

d. Compare two strings.

Experiment 9
Write a C program that works with complex numbers using a structure. Perform the following operations:

a. Reading a complex number.

b. Addition of two complex numbers.

c. Writing a complex number.

d. Multiplication of two complex numbers.

Experiment 10
Write a C program to create a database of students by using array of structure and perform following operations on it.

a. Accept/modify record of student

b. Search a particular record

c. Display all records

Experiment 11

Write a program in C that use both recursive and non-recursive functions to find the Factorial / GCD (greatest common divisor) of two given integers / Fibonacci series.

Experiment 12

Write a program in C to sort n integers using bubble sort.

Write a program in C to sort n integers using merge sort

Experiment 13

Write a program in C to search a number in a given list using linear / binary search.

Open Sources/Virtual lab:

1. https://nptel.ac.in/courses/106/104/106104128/ (Introduction to Programming in C)
2. https://nptel.ac.in/courses/106/105/106105171/ (Problem solving through Programming in C)

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Name: ENGINEERING GRAPHICS LABORATORY

Regulation Year: 2020-21

Course Code: MEE1101 **Credit: 03**

Course Category: Engineering Science Lab, **Contact hours: 30**

Recommended Pre-requisite: NA

COURSE OUTCOMES: *After going through this course the student will be able to*

CO1: *develop adequate competence in visualization, interpretation and expression of drawing of engineering parts and objects.*

CO2: *perform free hand sketching of basic geometrical constructions and multiple views of objects.*

CO3: *use universally accepted conventions and symbols in technical drawings.*

CO4: *draw orthographic projection of lines and plane surfaces*

CO5: *draw projection of solids and perform development of surfaces*.

Experiment Details:

Experiment 1:
Projections of Points and Lines (06 problems) **(03 Sessions)**

Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice, lettering, dimensioning, scale, concept of orthographic projections, symbol of first and third angle projection, projection of points, projections of lines (parallel to both reference planes, parallel to one and perpendicular to other, parallel to one and inclined to the other, and inclined to both the reference planes).

Experiment 2:
Projections of Planes and Solids (06 problems) **(02 Sessions)**

Projection of planes (perpendicular to one plane and parallel to the other, perpendicular to the one plane and inclined to the other, perpendicular to both the reference planes, plane inclined to both the reference planes, traces of planes).

Introduction to solids, projections of solids such as cube, tetrahedron, prism, pyramid, cylinder, cone & sphere (with axes parallel to both the reference plane, axis

perpendicular to one reference plane, axis inclined to one reference plane, and parallel to the other reference plane).

Experiment 3:
Sections of Solid and Development of Surfaces (03 problems) (02 Sessions)

Section planes, sectional views, true shape of sections for prism, cylinder, pyramid, cone & sphere (sectional plane parallel to one reference plane, sectional plane perpendicular to one reference plane inclined to other reference plane).

Introduction to development of surfaces of various solids (prism, cylinder, pyramid, cone & sphere), concept of development of lateral surface, methods, applications.

Experiment 4:
Intersections of Surfaces (03 problems) (02 Sessions)

Intersection to solids such as prism-prism, prism-pyramid, cylinder-cylinder and cylinder-cone etc.

Isometric Views and Projections (03 problems) (02 Sessions)

Isometric view & isometric projection of prism, pyramid, cone & cylinder with axis horizontal and vertical with construction of isometric scale.

Experiment 5:
Introduction to AUTOCAD (03Sessions)

Advantages of using Computer Aided Drafting (CAD) packages, applications of CAD, Cartesian and Polar Co-ordinate system, Absolute and Relative Co-ordinates systems; basic operation of drafting packages, use of various Basic Commands: Line, Point, Rectangle, Polygon, Circle, Arc, Ellipse, Poly line, Basic Editing Commands: Erase, Move, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror. Display Commands: Zoom, Pan, Redraw, and Regenerate for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Exercise on Basic Editing Commands and Display Commands.

Text Books:

T1. Engineering Drawing by N.D.Bhatt&V.M.Panchal, Charotar publishing House, 50th Edition, 2012

T2. Text Book on Engineering Drawing by Narayana / Kannaiah, Scitech publications, 9th Edition, 2012

T3. Engineering Drawing with an Introduction to AutoCAD by Dhanjay A. Johle, Tata McGraw Hill publications, 1st Edition 2007

Reference Books:

R1. Machine Drawing (Includes AutoCAD) by Ajeet Singh, Tata McGraw Hill publications, 1st Edition,2010

R2. Engineering Drawing by Shah and Rana, Pearson Education, 2nd Edition, 2009

R3. Engineering Drawing and Graphics by K.Venugopal, New Age International publications, 5th Edition, 2004

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Name: ENGINEERING MECHANICS

Regulation Year: 2020-21

Course Code: MEE1001 **Credit: 03**

Course Category: Engineering Science **Contact hours: 42 hrs**

Recommended Pre-requisite: NA

COURSE OUTCOMES:

CO1: *determine the centroid, centre of gravity and moment of inertia of various one dimensional and two dimensional objects as well as the resultant of distributed forces*

CO2: *analyze of the forces in members of trusses, and the concept of virtual work for bodies in equilibrium.*

CO3: *Apply the concept of rectilinear and curvilinear motion to solve the problems.*

CO4: *use D'Alembert's Principle, work and energy principle, impact, impulse and momentum principle for particle.*

Course Details:

Unit 1: Basics of Statics and Concurrent Forces: **(16 Hrs.)**

U1.1. **Statics of Particles:** Force System: Force, classification & representation, force as a vector, composition and resolution of forces, principle of superposition and transmissibility of forces.

Statics of Rigid bodies: Equilibrium of coplanar force system, free body diagrams, determination of reactions, equilibrium of a body under three forces, Lami's theorem. Moment of a force about a point and an axis, moment of coplanar force system, Varignon's theorem.

Friction: Introduction to wet and dry friction, laws of dry friction, Friction in inclined planes, application of friction in screw threads and bearings.

U1.2. Basic concepts, definitions, basic assumptions, scalar & vector quantities, parallelogram law, angle of friction, angle of repose.

Unit 2: Parallel and Distributed forces: (08 Hrs.)

U2.1. Parallel forces in a plane, Distributed Parallel forces in a plane, couple, resolution of a force into a force and a couple, moment of a couple.

Centroid and Moment of Inertia: Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, area moment of inertia of composite plane figures and mass moment of inertia, radius of gyration, parallel axis theorem, Pappus theorems, polar moment of inertia.

U2.2. Derivation of formulae for centroidal distances of standard areas and lines by integration method.

Unit 3: Basic Structural Analysis and virtual work: (06 Hrs.)

U3.1. **Basic Structural Analysis:** Plane truss, difference between truss and frame, perfect and imperfect truss, assumptions and analysis of plane truss, zero force members, analysis of perfect plane trusses by the method of joints, method of section.

Virtual work: Virtual displacement, principle of virtual work.

U3.2. Concept of work, knowledge of frame, knowledge of determinant

Unit 4: Kinematics of Particles: (06 Hrs.)

U4.1. **Rectilinear Motion:** Variable acceleration, Motion curves, concept of relative motion and simple dependent motion, Concept of position, displacement, distance, speed, instantaneous and average velocity and acceleration, uniform motion, uniformly acceleration motion, motion under gravity.

U4.2. **Curvilinear Motion:** Curvilinear motion, Projectile motion, Derivation of component of velocity and acceleration in three systems,

Unit 5: Kinetics of Particles: (06 Hrs.)

U5.1. D'Alembert's Principles, Work and energy, impulse and momentum, impact of bodies.

U5.2. Force and acceleration, derivation of coefficient of restitution

Tutorial content-

Tutorial No.1: Revision of basic Mathematical and Computing Skills

- Fundamentals on properties of circle, lines, triangles
- Fundamentals on basic trigonometry

Tutorial No.2: Revision of fundamental principles of mechanics

- Numerical on scalars, vectors expressing force as a vector
- Addition/ Subtraction of vectors
- Newton's laws of motion and Newton's law of gravitation

Tutorial No.3: Statics of Particles

- Numerical on resolution and composition of forces
- Resultant or equilibrant of concurrent coplanar force system
- Resultant or equilibrant of non-concurrent force system

Tutorial No. 4: Statics of Rigid bodies

- Drawing of free body diagrams
- Numerical on three force equilibrium
- Moments of a force about a point

Tutorial No. 5: Friction

- Numerical related to laws of friction
- Numerical related to block friction
- Numerical related to ladder friction and wedge friction

Tutorial No. 6: Parallel and Distributed forces

- Numerical on parallel forces and couple
- Numerical on equilibrium of simple beams under the action of parallel forces
- Numerical on hydrostatic pressure force

Tutorial No. 7 & 8: Centroid & Moment of Inertia

- Numerical on Centroid of one dimensional plane curve
- Numerical on Centroid of composite area
- Numerical on Moment of Inertia of composite plane figures

Tutorial No. 9 & 10: Analysis of truss and frames

- Analysis of plane trusses by method of joint
- Analysis of plane trusses by method of section
- Numerical on principle of virtual work

Tutorial No. 11: Kinematics of particles

- Numerical on constant acceleration, variable acceleration
- Numerical on kinematic curve

Tutorial No. 12: Projectile Motion

- Numerical on Projectile motion

Tutorial No. 13: Kinetics of particles

- Numerical on application of work energy principle involving spring force, friction force, externally applied force

Tutorial No. 14: Kinetics of particles

- Numerical on direct impact
- Numerical on impulse and momentum

Text Books :

T1. Engineering Mechanics, Timoshenko, Young & Rao, Tata McGraw Hill, 5th Edition, 2013.

T2. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press, 2009.

T3. Engineering Mechanics Statics and Dynamics, A. K. Tayal, Umesh Publications, 14th Edition, 2010.

Reference Books :

R1. Engineering Mechanics [Vol-I & II], Meriam & Kraige, Wiley India, 5th Edition, 2009

R2. Engineering Mechanics, R. C. Hibbeler, Pearson Education Inc., 11th Edition, 2009.

R3. Vector Mechanics for Engineers, F. P. Beer, E. R. Johnston Jr & E. R. Eisenberg, McGraw Hill, 8th Edition, 2007.

R4. Engineering Mechanics, S. Ramamrutham, Dhanpatrai Publication, 9th Edition, 2010

Open Sources:

SWAYAM; COURSERA; ANY OTHER MOOC PLATFORM.

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Name: ENGINEERING WORKSHOP

Regulation Year: 2020-21

Course Code: MEE1102 **Credit: 03**

Course Category: Engineering Science Lab **Contact hours: 20 Hrs.**

Recommended Pre-requisite: NA

COURSE OUTCOMES: *After going through this course the student will be able to*

CO1: *Perform different metal fitting work.*

CO2: *Perform basic welding work.*

CO3: *Understand the operations of machine tools.*

CO4: *Select the appropriate tools required for specific operation*

CO5: *Comprehend the safety measures required to be taken while using the tools*

Experiment Details:

Experiment No 1: Facing of a round headed bolt in lathe machine.

Experiment No 2: Straight & Step turning of a round headed bolt in lathe machine.

Experiment No 3: Thread cutting of a round headed bolt in lathe machine.

Experiment No 4: Edge preparation of a mild steel plate for butt welding operation.

Experiment No 5: Butt Joint: Joining of mild steel plates by MMAW welding process.

Experiment No 6: Lap Joint: Joining of mild steel sheets by Oxy-acetylene gas welding operation.

Experiment No 7: Making of Right angle by filing mild steel plates for open step fitting operation. Experiment No 8: Marking and punching operation on mild steel plates for open step fitting operation.

Experiment No 9: Sawing and surface finishing on mild steel plates for open step fitting operation.

Experiment No 10: Shaping of a hexagonal head bolt.

Experiment No 11: Preparation of a rectangular slot in milling machine.

Additional Experiments (Beyond syllabus):

Experiment No 12: Facing, Turning and thread cutting of a round headed bolt in CNC lathe machine.

Experiment No 13: Preparation of a rectangular slot in CNC milling machine.

NOTE: Out of the 13 experiments, At least 10 numbers of experiments will be performed in each semester.

Text Books:

T1. Workshop technology, Part I, W. A. J. Chapman

T2. Mechanical Workshop Practice, K. C. JOHN

T3. Elements of Workshop Technology, S. K. Hazra & Choudhury.

Reference Books

R1. Engineering, Lindsay White.

R2. Workshop Processes, Practices and Materials, Bruce Black.

R3. Basic Lathework, Stan Bray.

R4. A textbook of Welding Technology, O.P. Khanna.

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Name: INTRODUCTION TO MECHANICAL ENGINEERING (IME)

Regulation Year: 2020-21

Course Code: MEE1002 **Credit: 03**

Course Category: Engineering Science **Contact hours: 42 Hrs.**

Recommended Pre-requisite: NA

COURSE OUTCOMES:

CO1: *Understand the basics of thermodynamics and laws of energy interaction.*

CO2: *Calculate the resultant force, apply condition of equilibrium using different principles and analyze the problems involving dry friction.*

CO3: *Explain different manufacturing processes and properties of materials*

CO4: *Analyze the stresses and strains in axially-loaded members and explain stress-strain relationships for homogenous, isotropic materials.*

CO5: *Understand the basic fluid mechanics principle and develop the knowledge of Measurements and Measuring devices.*

Course Details:

Unit 1: Fundamentals of Thermodynamics **(10 Hrs.)**

U1.1. **Fundamental concepts and definitions:** Scope of Thermodynamics, Macroscopic and Microscopic approaches, Systems, Properties, Process, State, Cycle, Thermodynamic equilibrium, Pressure, Energy and its form, Work and heat, Enthalpy.

Laws of thermodynamics:

Zeroth Law of thermodynamics: Concepts of temperature, Zeroth law, Ideal gases.

First law of thermodynamics: First law of Thermodynamics for closed and open system, Flow processes and control volume, Flow work, Steady flow energy equation. Second Law of Thermodynamics: Statement of second Law, Heat Engine, Refrigerator, Heat Pump, Carnot cycle, Entropy.

U1.2. Applications of steady flow processes.

Unit 2: Introduction to Mechanics (8 Hrs.)

U2.1. **Force system and analysis:** Concurrent forces on a plane, Composition and resolution of forces and equilibrium of concurrent coplanar forces, Methods of moment, Friction.

U2.2. Centroids of composite plane figure and curves.

Unit 3: Production Processes and Engineering Materials (8Hrs.)

U3.1. **Production Processes:** Turning, Casting, Welding and Forming (Drawing, Forging & Extrusion) (Working principles with schematic diagram only)

Engineering Materials: Classification of Engineering materials, Material properties.

U3.2. Milling, Shaping, Drilling.

Unit 4: Stress and Strain Analysis (8Hrs.)

U4.1. **Simple stress and strain:** Concept & types of Stresses and Strains, Poison's ratio, stresses and strains in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stresses & strains in simple & compound bars under axial loading, Strain energy.

U4.2. Beams, Types, Shear force and bending moment diagrams for statically determinate beams.

Unit 5: Fluid Mechanics and Mechanical Measurements (8Hrs.)

U5.1. **Fluid mechanics:** Fluid properties, Pascal's law, Buoyancy, Bernoulli's theorem.

Mechanical measurements: Measurements of Temperature, Pressure, Velocity, Flow, (working principles only).

U5.2. Measurement of strain and forces.

Note: **At least 5 (Five) Assignments (one assignment from each unit) to be given to the students out of which best three can be taken for final assessment.**

Tutorial Content-

Tutorial 1	Numericals on measurement of pressure by simple manometers.
Tutorial 2	Numericals on pdV work for different non-flow processes.
Tutorial 3	Numericals on first law of thermodynamics.
Tutorial 4	Numericals on heat engine, refrigerator and heat pump.
Tutorial 5	Numericals on composition and resolution of forces.
Tutorial 6	Numericals on methods of moment.
Tutorial 7	Numericals on friction.
Tutorial 8	Numericals on axially loaded members.
Tutorial 9	Numericals on temperature stresses & strains.
Tutorial 10	Numericals on fluid properties, Pascal's law.

Text Books (minimum 3):

T1. "An Introduction to Mechanical Engineering", Jonathan Wickert, Kemper Lewis, Cengage Learning, 4th Edition, 2008.

T2. "Basic Mechanical Engineering", Sadhu Singh, S.Chand & Company Ltd, 1st Edition, 2009.

T3. "Basic Mechanical Engineering", P. K. Nag, Kartikeya Tripathy, C B Pawar,Tata McGraw Hill, 1st Reprint, 2009.

Reference Books (minimum 2)

R1. "Basic Mechanical Engineering", Jai Shankar V. P.,University Science Press, 1st Edition, 2013.

R2. "Basic Mechanical Engineering", C. M. Agrawal, Basant Agrawal, Willey Publication, Paperback edition, 2008.

R3. "Elements of Mechanical Engineering", V. K. Manglik, PHI Learning Pvt. Ltd, Paperback edition, 2013.

Open Sources:

SWAYAM; COURSERA; ANY OTHER MOOC PLATFORM.

Department of Mathematics

Subject Name: Mathematics-I

Regulation Year: 2020-21

Course Code: MHT1001 **Credit: 4**

Course Category: Basic Science **Contact hours: 52 Hrs**

Recommended Pre-requisite:

Elementary idea of sets, functions, trigonometry, two–dimensional co-ordinate geometry, fundamentals of differential and integral calculus of 10+2 standard.

COURSE OUTCOMES: After going through this course the student will be able to

CO1: Determine asymptotes and curvature of a curve given in cartesian and polar form.

CO2: applying limit and examine continuity and differentiability of a function of more than one variable.

CO3: calculate the gradients, divergence, curl and directional derivatives of functions of several variables along with the physical interpretation.

CO4: analyzing the integral problems involving line, double, volume and surface integrals and beta gamma integrals and their applications in mechanics.

CO5: solving periodic functions as a (Fourier) series of sine and cosine functions, find Fourier transform and inverse Fourier transforms of some functions.

Course Details:

Unit 1 Differential Calculus: [10 hours]

Mean Value Theorems [Rolle's Theorem, Cauchy and Lagrange's Mean Value Theorems], Asymptotes [Cartesian and Polar forms], Curvature [Cartesian and Polar forms].

Unit 2 Functions of two and more Variables and Special Functions: [10 hours]

Functions of two or more several variables: limit, continuity and differentiability, homogenous functions and Euler's theorem, higher order partial derivatives and Taylor's series, maximum and minimum values, beta, gamma functions and error functions**.**

Unit 3 Vector Differential Calculus: 10 hours]

Derivatives of vector valued functions, vector equations of curves, tangents of a curve, gradient, directional derivative, divergence and curl, line and double integrals.

Unit 4 Vector Integral Calculus: [10 hours]

Green's theorem, Surface integrals, Volume integrals, Gauss Divergence theorem and Stokes theorem.

Unit 5 Fourier series and Fourier transforms: [10 hours]

Fourier series, Fourier expansion of functions of any period, even and odd functions, half range expansion, Fourier transform and Fourier integral.

Text Books:

T1."Advanced Engineering Mathematics, Erwin Kreyszig, John Willy and Sons, 8th Edition, 1999.

Chapters: 8(8.4, 8.5, 8.9 – 8.11), 9(9.4 – 9.9), 10(10.1 – 10.4, 10.8 – 10.10).

T2. "Differential Calculus", Shanti Narayan and P.K. Mittal, S. Chand, 15th Edition, 2005.
Chapters: 8(8.1 – 8.5), 9(9.1-9.4, 9.6), 11(11.5, 11.6, 11.8, 11.11), 14(14.1 – 14.4), 15(15.1 – 15.5, 15.8).

T3. "Higher Engineering Mathematics", B.V.Ramana, The McGraw-Hill, 8th Edition, 2008.
Chapter: 11(11.1, 11.2).

Reference Books:

R4. "Higher Engineering Mathematics", B. S. Grewal, Khanna Publishers, 43rd Edition, 2014.
R5. "Text Book of Differential Calculus", G. Prasad, Pothisala, 17th Edition, 2006.
R6. "Text Book of Integral Calculus", G. Prasad, Pothisala, 14th Edition, 2004.

Open Sources:

SWAYAM; COURSERA; ANY OTHER MOOC PLATFORM.

Department of Mathematics

Subject Name: Mathematics-II

Regulation Year: 2020-21

Course Code: MHT1002 **Credit: 4**

Course Category: Basic Science **Contact hours: 52 Hrs**

Recommended Pre-requisite:
Elementary idea of differential and integral calculus of 10+2 standard.

COURSE OUTCOMES: *After going through this course the student will be able to*

CO1: *find rank, eigen values, eigen vectors of matrix.*

CO2: *solve a given system of linear equations.*

CO3: *analyse vector space, its dimension and basis.*

CO4: *solve first order and second order ordinary differential equations.*

CO5: *formulate models of electric circuits [LC, CR, LR, LCR circuits], mass spring systems, forced oscillations.*

CO6: *apply Laplace transform to solve initial value problems involving ordinary linear differential equations.*

Course Details:

Unit 1 Matrix Algebra: [10 hours]

Basic concepts of Matrices and Determinants, Symmetric, skew-symmetric matrices, Orthogonal matrices, Complex matrices, Hermitian and Skew-Hermitian matrices, Unitary matrices, triangular and diagonal matrices, Rank of a Matrix. Linear systems of equations – Existence and uniqueness of solutions , Gauss Elimination, Cramer's Rule, Matrix Inversion Method, Gauss Jordan elimination, LU factorization of matrices.

Unit 2 Vector Space and Eigen Values: [10 hours]

Basic concepts involving Vector space, Dimension and Basis, Orthogonal bases and Gram-Schmidt Orthogonalization. Eigen values and Eigen vectors of matrices, Similarity of matrices and Diagonalization.

Unit 3 Ordinary Differential Equations of First Order: [10 hours]

First order differential equations, Separable equation, exact differential equation, linear differential equation, Bernoulli's equation, application to electrical circuits and orthogonal trajectories, system of differential equations.

Unit 4 Ordinary Differential Equations of Second Order: [10 hours]

Linear differential equation of second and higher order, Homogeneous equation with constant co-efficient, Euler-Cauchy equations, Solution by undetermined co-efficient, Solutions by variation of parameters, Modeling of electric circuits.

Unit 5 Laplace Transforms: [10 hours]

Definition, Basic properties of Laplace transforms – Linearity property, Scaling, Shifting property, Derivative and Integral of Laplace transform and Transform of derivative and Integral of a function, Convolution Theorem. Applications of Laplace transforms in solving initial value problems involving ordinary differential equations, Integral equations.

Text Books:

T4. **"**Linear Algebra and Its Applications", Gilbert Strang, Cengage Learning, Fourth Edition, 2004.
Chapters: 1 (1.3 – 1.6), 2(2.1 – 2.4), 3(3.1, 3.4), 4(4.1 – 4.4), 5(5.1, 5.2, 5.5, 5.6)

T5. Advanced Engineering Mathematics, Erwin Kreyszig, John Willy and Sons, 8th Edition, 1999.
Chapters: 1 (1.1, 1.3 –1.7, 1.8), 2(2.1 - 2.4, 2.6 –2.10, 2.12), 3(3.1, 3.3), 5(5.1 – 5.6).

Reference Books:

R5. "A First course in Differential Equations with Modelling Applications", Dennis G.Zill, Cengage Learning, 10th Edition, 2013.

R6. "Higher Engineering Mathematics", B. S. Grewal, Khanna Publishers, 43rd Edition, 2014.

R7. "Higher Engineering Mathematics", B. V. Ramana, TMH, 1st Reprint, 2007.

Open Sources:

SWAYAM; COURSERA; ANY OTHER MOOC PLATFORM.

Department of Physics

Subject Name: (Engineering Physics)

Regulation Year: 2020-2021

Course Code: PHY1001 **Credit: 3**

Course Category: Basic Sciences **Contact hours: 42 Hrs**

Recommended Pre-requisite: Students must have the basic ideas of fundamental laws of physics and applications and expertise in solving mathematical equations relating to it.

COURSE OUTCOMES:

CO1: *Understand oscillatory systems including simple, damped and forced harmonic motion*

CO2: *Explain the wave characteristics for the interference, diffraction and polarization of light.*

CO3: *Understand the concept of quantum mechanics and its application to one dimensional problem.*

CO4: *Apply energy band concept for the functioning of semiconductor PN junction and lasers.*

CO5*: Understand BCS theory of superconductivity and properties of superconductors*

CO6*: Apply the concept of quantum confinement and surface effects in the nanoscale of material dimensions*

Course Details:

Unit 1: Oscillations, Waves and Interference: (12Hrs)

U1.1. **Oscillations and Waves**: Simple harmonic oscillation, Damped harmonic oscillation, Forced vibration, Resonance, Waves and Wave equation, Wave packet, Phase and group velocity, Superposition of waves, multiple beam superposition, coherent and incoherent superposition.

U1.2. **Interference:** Newton's ring, Determination of wave length of light and refractive index of liquid by Newton's ring experiment.

Unit 2 Diffraction and Polarization: (10Hrs)

U2.1. **Diffraction:** Fresnel and Fraunhofer Diffraction, Zone plate, Fraunhofer Diffraction due to single slit, Diffraction due to multiple slit, Determination of wavelength of light using plane transmission grating.

U2.2. **Polarization:** Polarization of waves, Plane, circularly and elliptically polarized light, polarization by reflection, refraction, Brewster's law, Double refraction,

Malus law, Nicol prism (Construction and use), Quarter-wave plate and Half wave plate.

Unit 3 Elementary Quantum mechanics and applications: (08Hrs)

U3.1. **Elementary Quantum mechanics:** Historical overview, wave aspect of particles: matter waves, de-Broglie Hypothesis, Heisenberg's Uncertainty principle (statement and interpretation), Basic features of quantum mechanics: States of system, wave function, probability density, Schrödinger's equation - Time dependent and time independent, observables and operators, Eigen value and Eigen functions, Expectation values.

U3.2. **Application of Quantum Mechanics:** Solutions of one dimensional problems, Free particles, Infinite deep potential well (particle in a box), Quantum mechanical tunneling (concept only).

Unit 4 Semiconductor Physics, Lasers and applications: (05Hrs)

U4.1. **Semiconductor Physics:** Band theory of solids, Classifications of solids in terms of band theory, Types of semiconductor (intrinsic and extrinsic), Fermi-Dirac probability distribution function, Fermi level in intrinsic and extrinsic semiconductors, Energy band diagram of n-type and p-type semiconductors, p-n junction diode (basic structure and working principle).

U4.2. **Lasers and application:** Stimulated absorption, spontaneous and stimulated emission, population inversion, basic principles of lasing action, types of laser and its applications (in medical, in communication system i.e. fiber optics).

Unit 5 Superconductivity and Nanoscience & Nanotechnology: (05Hrs)

U5.1. **Superconductivity:** Introduction and properties of superconductors (zero resistance, Meissner effect, critical field, London penetration depth), BCS theory of superconductivity and applications.

U5.2. **Nanoscience and Nanotechnology:** Introduction, Nanoscience and Nanomaterials, quantum size effects: Zero, One, Two-dimensional structures and applications.

Text Books:

T1. Engineering Physics, H.K.Malik and A.K.Singh, Tata McGraw Hill, 1st edition, 2019.

T2. Engineering Physics, D.K. Bhattacharya and Poonam Tandon, Oxford University Press, 5th edition, 2015.

T3. Concepts of Modern Physics, Arthur Beiser, Tata McGraw- Hill, 7th edition, 2015.

Reference Books:

R1. Engineering Physics, D. Joshi, Tata McGraw –Hill, 1st Edition, 2010.
R2. Semiconductor Physics and Devices, Donald A. Neamen, 3rd Edition, Tata McGraw-Hill, 2007.
R3. Introduction to Quantum Mechanics, M. Das and P. K. Jena, SrikrishnaPrakashan, 2010.
R4. Optics, A.K. Ghatak, Tata McGraw Hill Publishing Company Limited, New Delhi., 5th Edition, 2012
R5. Fundamentals of Physics, Resnick and Halliday, John Wiley and Sons, 10th edition, 2013.
R6. Engineering Physics, Dr S N Jena and Dr. H.R Pattnaik,University Science Press,2013.

Open Sources:

Open Sources: NPTEL (https://nptel.ac.in/courses/122/107/122107035/) Coordinated by IIT Roorkee, PhET(Interactive Simulations) https://phet.colorado.edu/en/simulations/category/physics

Department of Physics

Subject Name: (Engineering Physics Laboratory)

Regulation Year: 2020-2021

Course Code: PHY1101 **Credit: 2**

Course Category: Laboratory **Contact hours: 30**

Recommended Pre-requisite: Students expertise in measuring fundamental quantities, calculations and knowledge in plotting graphs

COURSE OUTCOMES:

CO1: *Analyze the basic properties of waves and oscillations.*

CO2: *Analyze the wave properties of optical phenomena like interference, diffraction and polarization.*

CO3: *Explain the properties of semiconductors used in various electronic devices.*

CO4: *Estimate the basic properties like modulus of elasticity and thermal conductivity of solids and surface tension of liquid*

Experiment Details:

Experiment No 1: Determination of Acceleration due to Gravity by Bar/Kater's pendulum.

Experiment No 2: Verification of Laws of Vibration of strings using Sonometer.

Experiment No 3: Determination of Wavelength of Light by Newton's rings Apparatus.

Experiment No 4: Determination of wave length of light of light by Biprism.

Experiment No 5: Determination of Grating element of a Plane diffraction grating.

Experiment No 6: Determination of wavelength of Laser source by Diffraction method.

Experiment No 7: Plotting of characteristic curves of a P-N junction Diode.

Experiment No 8: Plotting of characteristic curves of BJT.

Experiment No 9: Study of Hall Effect.

Experiment No 10: Determination of band gap of semiconductor by Four Probe method.

Experiment No 11: Determination of Planck's constant by Photoelectric effect.

Experiment No 12: Determination of specific rotation of sugar solution by using a polarimeter

Additional Experiments (Beyond syllabus):

Experiment No 13: Determination of Young's Modulus by Searle's Method.

Experiment No 14: Determination of Rigidity Modulus by Static Method.

Experiment No 15: Determination of Thermal Conductivity by Lee's disc method.

Experiment No 16: Determination of Surface Tension by Capillary Rise Method.

NOTE: Out of the 16 experiments, At least 10 numbers of experiments will be performed in each semester.

Text Books:

T1: Engineering Physics", Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010.

T2: Physics for Scientists and Engineers with Modern P hysics, Raymond J. Serway& John W. Jewett, Seventh Edition, Thomson / Cengage Learning, New Delhi, 2010.

T3: Concepts of Modern Physics", Beiser Arthur, (6th) New, Tata McGraw Hill Pub. Co, 2005.

Reference Books

R1: University Physics with Modern Physics", Young and Freedman – 12th Ed. (Pearson Education), 2008.

R2: Lectures on Physics", Volume 1, 2 and 3 by Richard P. Feynman, NarosaPublisers / Pearson Education, 2012.

R3: Engineering Practical Physics-S. Panigrahi and B. Mallick, S. Publishers, 2015.

R4: A Manual of Practical Engineering Physics and material Science, A. S. Vasudeva, S. Chand, 2003.

Open Sources/Virtual lab: PhET(Interactive Simulations) https://phet.colorado.edu/en/simulations/category/physics, https://www.vlab.co.in

Department of Humanity and Social Studies

Subject Name: General Communication in English (GCE)

Regulation Year: 2020-2021

Course Code: HSS1102 **Credit: 3**

Course Category: Basic Science **Contact hours: 42hrs**

Recommended Pre-requisite: The students should have proficiency in different language skills. They should be able to understand and communicate in English language.

COURSE OUTCOMES:

CO1: *The enrolled candidates will be exposed to and be given adequate practice in verbal and non-verbal communication requirements including different processes and factors involved with each of them through various JAM activities.*

CO2: *At the end of the course, the students will have the benefits of accent neutralization and learn how to overcome the mother tongue influence on their English pronunciation.*

CO3: *They will learn how to use the dictionary for correct pronunciation and phonemic transcription. With adequate practice in co 3 they are hoped to be auto learners of English pronunciation*

CO4: *At the end of the course, they will be able to express themselves effectively in speech and writing without any grammatical errors.*

CO5: *At the end, they will be able to edit their own writing and that of others.*

Experiment Details:

Experiment 1: Process and Factors of communication
Experiment 2: Verbal and non-verbal communication
Experiment 3: Introduction to the sounds of English: IPA
Experiment 4: Consonant sounds
Experiment 5: Vowels and diphthongs
Experiment 6: Phonemic transcription
Experiment 7: Syllabic division and stress
Experiment 8: Consonant clusters and Problem sounds
Experiment 9: Weak forms
Experiment 10: Intonation
Experiment 11: Time, tense and aspect
Experiment 12: Finite, Non-finite verb and Stative, Dynamic verb

Experiment 13: Modals
Experiment 14: Subject-Verb Agreement
Experiment 15: Voice change
Experiment 16: Preposition and phrasal verb
Experiment 17: Conditional sentences
Experiment 18: Negatives and Interrogatives
Experiment 19: Sentence Reduction
Experiment 20: Error correction

Open Sources/Virtual lab:

Text Books:

T1. An Introduction to Professional English and Soft Skills by B.K.Das et al., Cambridge University Press, 2012

Books recommended:

R1. English Phonetics and Phonology by Peter Roach ,CUP,

R2. Ship or Sheep by Ann Becker, CUP

R3. Oxford Practice Grammar by J Eastwood ,CUP

R4. University Grammar by Quirk, Greenbaum and Svartvik

R5. Effective Technical Communication by Rizvi, Tata Mc Graw- Hill, 2008

Department of Humanity and Social Studies

Subject Name: Professional Communication in English (PCE)

Regulation Year: 2020-2021

Course Code: HSS1103 **Credit: 3**

Course Category: Humanities **Contact hours: 42 Hrs**

Recommended Pre-requisite: The students should have proficiency in different language skills. They should be able to understand and communicate in English language.

COURSE OUTCOMES:

CO1: *They will have adequate background knowledge of cross-cultural communication and patterns of communication. In addition, they will have adequate practice with bias-free and formal and informal language, so that they can one day become successful players at the international level.*

CO2: *They will be in a position to read various business-related writings, evaluate them and retrieve information quickly in record time. In brief, they are expected to be efficient and perceptive readers of all business-related writings.*

CO3: *In addition, they will be able to make notes and prepare short summaries using short and simple expressions of their own.*

CO4: *They will have adequate exposure to and practice in developing various types of paragraphs, i.e., narrative, descriptive and argumentative types.*

CO5: *At the end, with a certain measure of confidence, they will be able to write, on their own, various types of business correspondence, i.e., business letters, memos, notices, reports, job applications.*

ExperimentDetails:

Experiment 1: Communication and Patterns of Communication

Experiment 2: Formal and informal Communication, Bias-free Language

Experiment 3: Cross-cultural communication

Experiment 4: Reading and its sub-skills

Experiment 5: Note- making

Experiment 6: Summarizing

Experiment 7: Comprehension Practice

Experiment 8: Practising inferential and evaluative skills

Experiment 9: Synonym, antonym and one-word substitution

Experiment 10: Collocation, Word formation and derivation
Experiment 11: Paragraph writing-1 (Narrative)
Experiment 12: Paragraph writing-2 (Descriptive)
Experiment 13: Paragraph writing-3 (Logical Approach)
Experiment 14: Business letters
Experiment 15: Memo, Notice, E-mail
Experiment 16: Text Conversion
Experiment 17: Report writing
Experiment 18: Job application
Experiment 19: Resume writing
Experiment 20: Making a group presentation

Open Sources/Virtual lab:

Text Books:

T1. An Introduction to Professional English and Soft Skills by B.K.Das et al., Cambridge University Press

T2. Business Communication Today by Bovee et al , Pearson

Reference Books:

R1. Business Communication by Meenakshi Raman and Prakash Singh ,Oxford

R2. Reading-4 by S. Greenall and D. Pye ,CUP

R3. Writing-4 by Little John ,CUP

R4. Brush Up your English by S.T.Imam ,BharatiBhawan Publishers

R5. Word Power Made Easy by Norman Lewis