SHU221 Chemistry

Teaching Scheme: 04L Total: 04 Credit:04
Evaluation Scheme: MSE 30 + 10TA + 60ESE Total Marks: 100
ESE Duration: 2 Hrs 30 min

Spectroscopic techniques and applications: Principles of spectroscopy, Instrumentation and Applications of Electronic spectroscopy. Fluorescence, AAS (Atomic absorption spectroscopy) and UV spectroscopy in medicine.

Engineering Chemistry: Water chemistry-Defination,Types of hardness and softening methods.Corrosion-Defination and mechanism. Composite material–Defination, Classification and Applications, Refractories-Defination, Requisites and Types

Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states

Stereochemistry: Representations of 3 dimensional structures, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.

Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, Synthesis of a commonly used drug molecule.

Use of free energy in chemical equilibria: Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria.

Text Books:

1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
4. Physical Chemistry, by P. W. Atkins
5. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

Reference Books:

1. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

SHU222 Integral Calculus and Differential Equations

Teaching Scheme : 03 L + 01T Total 04 Credit: 04
Evaluation Scheme : 30 MSE + 10 TA + 60 ESE Total marks : 100
ESE duration : 2 Hrs 30 min.

Course Objectives:

I. To familiarize the prospective engineers with techniques in multivariate integration.
II. To familiarize the techniques in ordinary differential equations.
III. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Multiple Integration: Double integrals (Cartesian & polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar);Triple integrals, orthogonal curvilinear coordinates, Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities).

First order ordinary differential equations:

Exact & non exact equations, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher orders:
Linear differential equation with constant coefficient, Second order linear differential equations with variable coefficients; Cauchy-Euler equation, method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Numerical Methods:
Solution of Algebraic and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Text Books:
1. Higher Engineering Mathematics, B. S. Grewal, 43th edition, Khanna publication,new Delhi 2013.
2. A text book of Applied Mathematics, P. N. Wartikar and J. N. Wartikar (Vol I and II), Pune Vidyarthi Griha Prakashan, Pune, 7thEdition,2003.

Reference Books:
1. Higher Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publications,2007.
2. Advanced Engineering Mathematics, H. K. Dass, S. Chand and Sons,12th edition, 2002.
3. A Text book of Engineering Mathematics, N.P.Bali, Manish Goyal, Laxmi Publications,7thedition 2007.
4. Advanced Engineering Mathematics, Erwin kreyszig, 9 Edition, John Wiley & Sons, 2006.
5. An Introduction to Ordinary Differential Equations, E. A. Coddington, Prentice Hall India, 1995.
6. Engineering Mathematics for first year, Veerarajan T.,Tata McGraw-Hill, New Delhi, 2008.

Course Outcomes:
The students will able:
SHU222.1. to use the mathematical tools needed in evaluating multiple integrals and their usage.
SHU222.2. to apply the effective tools of solutions of differential equations that model physical processes.
SHU222.3. to solve mathematical problems using numerical techniques
SHU222.4. to solve various engineering problems with the help of knowledge of differential equations with higher order.

CSU221 Programming for Problem Solving

Teaching Scheme: 03 L Total-03 Credits: 03
Evaluation Scheme: MSE 30 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE: 2Hrs. 30min.

Course Objectives:
I. To introduce basics of programming and develop logical thinking of students.
II. To help students understand how to model real world problems into the software
III. To implement mathematical statistical, applications into programming using C Language.

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence, Conditional Branching and Loops ,Writing and evaluation of conditionals and consequent branching ,Iteration and loops
Arrays: Arrays (1-D, 2-D), Character arrays and Strings

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Structure : Structures, Defining structures and Array of Structures

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Outcomes

The student will able to

CSU221.1formulate simple algorithms for arithmetic and logical problems and translate the algorithms to programs.

CSU221.2 implement conditional branching, iteration and recursion.

CSU221.3 use arrays, pointers and structures to formulate algorithms and programs.

CSU221.4 apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

CSU221.5 apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

MEU221 Engineering Graphics

Teaching Scheme : 02 L Total 02 Credit : 02

Evaluation Scheme : 30 MSE + 10 TA + 60 ESE Total marks : 100

ESE duration : 3 Hrs.

Course Objectives:

I. To inculcate imagination and mental visualization capabilities for interpreting the geometrical details of common engineering objects.

II. To impart knowledge about principles/methods related to projections of one, two and three dimensional objects.

III. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

IV. To be able to read, understand and apply the knowledge of orthographic projections (production related features and instructions) in manufacturing industry, process industry and other allied engineering application.

V. To create the image of three dimensional figures with the help of isometric projections.

All projections in this course are restricted to First Quadrant only.

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines used in drawing practices, dimensioning, Introduction to scale i.e. full size, Reducing scale and enlarging scale.

Conic sections (No focus and directrix method); Cycloid, and Involute; Principles of Orthographic Projections, concepts of four quadrants and conventions used to represent methods of orthographic projection. Projections of Points and lines inclined to both planes (excluding applications of straight lines.)

Projections of Planes: Projection of planes when it is parallel to one & perpendicular to other reference plane, lying in reference plane, inclined to one & perpendicular to other reference plane, inclined to both reference planes. Auxiliary planes - Auxiliary Inclined Plane (AIP) and Auxiliary Vertical Plane (AVP), Use of Auxiliary Plane method for solving the problems.

Projections of Solids: cube, tetrahedron, prism, pyramid, cylinder and cone, projections of above solids when axis perpendicular to one of the reference planes, axis inclined to one & parallel to other reference plane, axis inclined to both the reference planes.

Sections and Sectional Views of Right Angular Solids: Section planes, sectional views, Draw the sectional orthographic views of geometrical solids like Cube, Tetrahedron, Prism, Cylinder, Pyramid, Cone cut by different section planes (when solid is in simple position, when axis is parallel to one & inclined to other reference plane)

Development of surfaces of Regular Solids – Cube, Tetrahedron, Prism, Pyramid, Cylinder and Cone; (No reverse development)

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of Planes, Simple Solids; Conversion of Orthographic projections into Isometric Projections.

Orthographic Projections: Conversion of Pictorial views into Orthographic Projections.

Overview of Computer Graphics: Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects; consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command;

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

1.Get acquainted with principles of engineering drawing
2.Practice standard conventions to prepare engineering drawings
3. Visualize the geometry and shape of the products
4. Translate the geometrical information of engineering objects into engineering drawings
5. Use computer aided drafting/solid modeling software

Text Book:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. D.N. Johle, Engineering Drawing, Tata Megraw-hill publishing Co. Ltd
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals.

MEU 222 BASIC MECHANICAL ENGINEERING

Teaching Scheme: 02 L Total = 02 Credit: 02
Evaluation Scheme: 30 MSE + 10 TA + 60 ESE Total Marks: 100
Duration of ESE: 2 hrs. 30 min.

Course Objective:

I. To demonstrate basic concepts of thermodynamics.
II. To get conversant with basics of heat transfer, refrigeration, internal combustion engines, machine element and machine tools

Thermodynamics Thermodynamic work, p-dV work in various processes, p-V representation of various thermodynamic processes and cycles Ideal gas equations, Properties of pure substance, Statements of I and II laws of thermodynamics and their applications in Mechanical Engineering. Carnot cycle for Heat engine, Refrigerator and Heat pump.

Energy conversion devices (Theoretical study using schematic diagrams only) Package Boiler, Turbine(Impulse & Reaction turbine, Gas turbine, Hydraulic turbines), Working principle and applications of Reciprocating I.C. engines, Air motor. Reciprocating pumps (single acting & double acting), reciprocating compressor, rotary compressors, fans, blowers, Study of household refrigerator, window air conditioner, split air conditioner Ratings and selection criteria of above devices. Refrigerants and their impact on environment.

Heat Transfer Statement and explanation of Fourier's law of heat conduction, Newton;s law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties. Selection of heat sink and heat source. Power Plants (Description with Block Diagrams) Thermal, Hydroelectric, Nuclear and Solar-Wind Hybrid Power Plants.

Machine elements: Power transmission shafts, axles, keys, bush and ball bearings, Flywheel and Governors. Power Transmission Devices Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and single plate), brakes (types and applications only) Applications of these devices. Mechanisms:.(Descriptive treatment only) Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism

Materials Used in Engineering and their Applications Metals – Ferrous and Non-Ferrous, Nonmetallic materials, Material selection criteria Design considerations Steps in Design Introduction to manufacturing processes and Their Applications: Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.

Machine Tools (Basic elements, Working principle and types of operations) Lathe Machine – Centre Lathe Drilling Machine – Study of Pillar drilling machine Introduction to NC and CNC machines Grinding machine, Power saw, Milling Machine.

Text Books:

1. P. K Nag "Thermodynamics", Tata McGraw-Hill Publishing Co. Ltd
2. Hajra-Chaudhari " Workshop Technology"

Reference Books:

1. Yunus A. Cengel and Boles," Thermodynamics",Tata McGraw-Hill Publishing Co. Ltd
2. Arora and Domkunwar, "Thermal Engineering", Dhanpat Rai and Sons.
3. R. K. Rajput, "Heat transfer", S Chand Publication, Delhi.
4. V. B. Bhandari "Design of Machine Elements" Tata McGraw-Hill Publishing Co. Ltd

Course Outcomes:

At the end of the course: Students will be able apply the basics of Mechanical Engineering

SHU223 Chemistry Lab

Teaching Scheme: 02P Total: 02 Credit: 1
Evaluation Scheme: Internal Continuous Assesment Total Marks: 50

Following is the representative list of experiments. Minimum eight experiments are to be performed

List of experiments:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Synthesis of a polymer/drug
8. Saponification/acid value of an oil
9. Chemical analysis of a salt
10. Determination of the partition coefficient of a substance between two immiscible
11. liquids Adsorption of acetic acid by charcoal.
12. Determination of cell constant and conductance of solutions
13. Potentiometry - determination of redox potentials and emfs

CSU222 Programming for Problem Solving Lab

Teaching Scheme: 04P Total 04 Credit : 02
Evaluation scheme: Internal Continuous Assessment Total Marks: 50

Course Objectives:

I. To introduce basics of programming and develop logical thinking of students.
II. To help students understand how to model real world problems into the software
III. To implement mathematical statistical, applications into programming using C Language.

The sample list of programs is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same.
Aim of the list is to inform about minimum expected outcomes.

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical

integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Laboratory Outcomes
The student will able to
CSU222.1 formulate the algorithms for simple problems and translate given algorithms to a working and correct program
CSU222.2 correct syntax errors as reported by the compilers
CSU222.3 write iterative as well as recursive programs
CSU222.4 represent data in arrays, strings and structures and manipulate them through a program
CSU222.5 declare pointers of different types and use them in defining self-referential structures.
CSU222.6 create, read and write to and from simple text files.

MEU223 Engineering Graphics Lab

Teaching Scheme : 04P Total 04 Credit : 02
Evaluation scheme: Internal Continuous Assessment Total Marks: 50

Course Objectives:

I. To inculcate imagination and mental visualization capabilities to read, interpret and construct basic geometrical details of common engineering objects using geometrical instruments as well as graphics software
II. To develop graphical skills related to projections of one, two and three dimensional objects/engineering products
III. To expose them to existing national standards related to technical drawings
IV. To apply the knowledge of orthographic projections (production related features and instructions) in manufacturing industry, process industry and other allied engineering application
V. To create the image of three dimensional figures with the help of isometric projections
VI. To develop capability of computer-aided drawing in engineering area using Solid Modelling software

Half imperial (A2-594 mm X 420mm) sheets are to be drawn from the list shown below.

1) Various Engineering Curves (Four Problems)
2) Projections of Lines (Four Problems)
3) Projections of Planes (Four Problems)
4) Projections of Solids (Four Problems)
5) Projections of Sections of Solids (Two Problems)
6) Development of Surfaces (Two Problems)
7) Orthographic Projections (Two problems on sheet and two problems using CAD software)
8) Isometric drawing and Isometric projections (Two problems on sheet and two problems using CAD software)
Course Outcomes: After completion of course, student will be able to:-
1 Apply the standard conventions and practices of engineering drawing

2 Construct representative drawings of one, two and three dimensional objects/engineering products with geometric details
3 Translate the geometrical information of engineering objects into engineering drawings
4 Draw orthographic projections of lines, planes and solids
5 Prepare sectional and isometric views of simple solids
6 Use computer aided drafting/solid modeling software.

MEU224 Workshop Practice - II

Teaching Scheme : 02P Total 02 Credit : 01
Evaluation scheme: Internal Continuous Assessment Total Marks: 50

Course Objectives:

I. To prepare a mould and jobs using casting operation
II. To operate various machines like Lathe, shaper, milling, Drilling machines etc.
III. To prepare a job using various machining operations
IV. To explain the operation of CNC machine
V. To make the students well versed with basic electronic components and PCB designing rules
VI. To learn processes etching, printing, drilling, soldering, testing soldering of electronic components
VII. To be able to set, operate and use survey instruments for Civil Engineering layout.
VIII. To be able to get acquainted with procedure of bar bending, detailing of reinforcements for various structural element
IX. To introduce students with different type of masonry works

Group A

Fitting: Introduction to types of Fits, concepts of interchangeability, different fitting tools & their use, different measuring tools, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping. One job involving fitting to size, male-female fitting with drilling and tapping.

Moulding & Casting: Introduction to moulding tools and equipments; One job on preparation of mould, Demonstration of casting process

Pipe fitting & joints: Introduction to different types of pipefitting and joints; Demonstration of pipe threading and pipe fitting; one job on pipe threading

Group B

Machining processes: Demonstration covering the basic operation on Lathe, Shaper, Drilling and Milling machines, One job on lathe machine covering Turning, Taper Turning and Threading operations, Introduction to CNC operated machines

Electronics Workshop: PCB making, soldering, testing and desoldering of a simple electronic circuit; probe making. One job on above

Civil workshop: Introduction to auto level and theodolite for simple layouts, reinforcement bar bending and tieing, different bonds for brick masonry; preparation of concrete; layout of simple plan, pipe joints making, use of total station, various reinforcement detailing; one job on above

The shops listed in Group A are common to students of all programs and the shops of Group B are allotted as shown below.

Programme Name	Group B	Group A
Civil Engg.	Civil Workshop	For all branches (Fitting, Moulding & Casting, Pipe fitting & Joints)
Mechanical Engg.	Machining Processes	
Electrical Engg.	Electronics Workshop	
Electronics & TC Engg.	Electronics Workshop	
Computer Science & Engg.	Electronics Workshop	
Information Technology	Electronics Workshop	
Insrumentation Engg.	Electronics Workshop	

Course Outcomes:

After completion of course student will be able to-

MEU221.1 Prepare a mould and job using casting process

MEU221.2 Operate various machines like Lathe, shaper, milling, Drilling machines etc.

MEU221.3 Prepare a job using various machining operations

MEU221.4 Explain the operation and working of CNC machines

MEU221.5 Built electronic circuits on PCB

MEU221.6 Handle different basic electronics components and equipments

MEU221.7 Record field book and calculate reduced levels.

MEU221.8 Interpret structural drawings and also should be able to distinguish reinforcements detailing of various structural elements

MEU221.9 Distinguish different masonry bond types and their purposes.