VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

Scheme of Teaching and Examination 2018 – 19

Outcome Based Education(OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2018 – 19)

I SEMESTER B.E./B.Tech (CHEMISTRY GROUP)

Sl. No	Course and Course Code		Course Title	Teaching Department	Paper Setting Board	Teaching Hours /Week			Examination				Credits
						Theory Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	BSC	18MAT11	Calculus and Linear Algebra	Mathematics	Mathematics	3	2	--	03	40	60	100	4
2	BSC	18CHE12	Engineering Chemistry	Chemistry	Chemistry	3	2	--	03	40	60	100	4
3	ESC	18CPS13	C Programming for Problem Solving	Computer Science and Engineering	Computer Science and Engineering	2	2	--	03	40	60	100	3
4	ESC	18ELN14	Basic Electronics	ECE/E and I/ TC	E and C Engineering	2	2	--	03	40	60	100	3
5	ESC	18ME15	Elements of Mechanical Engineering	ME, Auto, IP, IEM, Mfg Engineering	Mechanical Engineering	2	2	--	03	40	60	100	3
6	BSC	18CHEL16	Engineering Chemistry Laboratory	Chemistry	Chemistry	--	--	2	03	40	60	100	1
7	ESC	18CPL17	C Programming Laboratory	Computer Science and Engineering	Computer Science and Engineering	--	--	2	03	40	60	100	1
8	HSMC	18EGH18	Technical English– I	Humanities	Humanities	--	2	--	03	40	60	100	1
					TOTAL	12	12	04	24	320	480	800	20

Note: BSC: Basic Science Courses, ESC: Engineering Science Courses, HSMC: Humanity, Social Science and Management Courses.

Definition of Credit:
1 hour Lecture (L) per week per semester =1 Credit
2 hour Tutorial (T) per week per semester =1 Credit
2 hour Practical/Laboratory/Drawing (P) per week per semester =1 Credit.

ADVANCED CALCULUS AND NUMERICAL METHODS

Semester	: II	CIE Marks	: 40
Course Code	: 18MAT21	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 3:2:0	Exam Hours	: 03
	Credits : 04		

Course Learning Objectives: This course viz., Advanced Calculus and Numerical Methods (**18MAT21**) aims to prepare the students:
- To familiarize the important tools of vector calculus, ordinary/partial differential equations and power series required to analyze the engineering problems.
- To apply the knowledge of interpolation/extrapolation and numerical integration technique whenever analytical methods fail or very complicated, to offer solutions.

MODULE-I
Vector Calculus:-
Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- Illustrative problems.
Vector Integration: Line integrals, Theorems of Green, Gauss and Stokes (without proof). Applications to work done by a force and flux.
(RBT Levels : L1 & L2)

MODULE-II
Differential Equations of higher order:- Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters; Cauchy's and Legendre homogeneous equations. Applications to oscillations of a spring and L-C-R circuits.
(RBT Levels : L1, L2 & L3)

MODULE-III
Partial Differential Equations(PDE's):- Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables.
(RBT Levels : L1, L2 & L3)

MODULE-IV

Infinite Series:- Series of positive terms- convergence and divergence. Cauchy's root test and D'Alembert's ratio test(without proof)- Illustrative examples.

Power Series solutions:- Series solution of Bessel's differential equation leading to *Jn(x)*- Bessel's function of first kind-orthogonality. Series solution of Legendre's differential equation leading to *Pn(x)*-Legendre polynomials. Rodrigue's formula (without proof), problems.

(RBT Levels : L1 & L2)

MODULE-V

Numerical Methods:
Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods(only formulae)- Illustrative examples.

Numerical integration: Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules, Weddle's rule (without proof) –Problems. **(RBT Levels : L1, L2 & L3)**

Textbooks:

1. **B.S. Grewal:** Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.

2. **E. Kreyszig:** Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. **C.Ray Wylie, Louis C.Barrett :** "Advanced Engineering Mathematics", 6th Edition, 2. McGraw-Hill Book Co., New York, 1995.

2. **James Stewart :** "Calculus –Early Transcendentals", Cengage Learning India Private Ltd., 2017.

3. **B.V.Ramana:** "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

4. **Srimanta Pal & Subobh C Bhunia:** "Engineering Mathematics", Oxford University Press, 3rd Reprint, 2016.

5. **Gupta C.B., Singh S.R. and Mukesh Kumar:** "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Web links and Video Lectures:
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

Course Outcomes: On completion of this course, students are able to:

CO1 : Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.

CO2 : Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.

Co3 : Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.

CO4 : Explain the applications of infinite series and obtain series solution of ordinary differential equations.

Co5 : Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.

Question Paper Pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**

- The question paper will have ten full questions carrying equal marks.

- Each full question carries 20 marks.

- There will be two full questions (with a maximum of four sub questions) from each module.

- Each full question will have sub questions covering all the topics under a module.

- The students will have to answer five full questions, selecting one full question from each module.

ENGINEERING CHEMISTRY

Semester	: I/II	**CIE Marks**	: 40
Course Code	: 18CHE12/22	**SEE Marks**	: 60
Teaching Hours/week (L:T:P)	: 3:2:0	**Exam Hours**	: 03
	Credits : 04		

Course Learning Objectives:
This course **(18CHE12/22)** will enable students to
- Master the basic knowledge of engineering chemistry for building technical competence in industries, research and development.
- To develop knowledge in the fields of use of free energy in chemical equilibrium, electrochemistry and energy storage systems, Corrosion and metal finishing.
- To understand the importance of energy systems, environmental pollution, waste management, water chemistry, Instrumental methods of analysis and Nanomaterials.

MODULE-I
Electrochemistry and Energy storage systems
Use of free energy in chemical equilibria: Thermodynamic functions: Definitions of free energy and entropy. Cell potential, derivation of Nernst equation for single electrode potential, numerical problems on E, E0, and Ecell

Electrochemical energy systems: Reference electrodes: Introduction, construction, working and applications of Calomel electrode. Ion-selective electrode – Definition, construction and principle of Glass electrode and determination of pH using glass electrode. Electrolyte concentration cells, numerical problems

Energy storage systems: Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Ni-MH and Li-ion batteries

(RBT Levels: L3)

MODULE-II
Corrosion and Metal finishing
Corrosion: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration - pitting and water line). Corrosion control: Anodizing – Anodizing of aluminium, Cathodic protection - sacrificial anode and impressed current methods, Metal coatings – Galvanization

Metal finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing electroplating-Polarization, decomposition potential and overvoltage. Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel & copper, distinction between electroplating and electroless plating processes

(RBT Levels: L1 & L2)

MODULE-III
Energy Systems

Chemical Fuels: Introduction, classification, definitions of CV, LCV, and HCV, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Knocking of petrol engine – Definition, mechanism, ill effects and prevention. Power alcohol, unleaded petrol and biodiesel

Fuel Cells: Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte, and solid oxide fuel cell (SOFCs)

Solar Energy: Photovoltaic cells- introduction, construction and working of a typical PV cell, Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells

MODULE - IV
Environmental Pollution and Water Chemistry

Environmental Pollution: Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion

Waste Management: Solid waste, e-waste & biomedical waste: Sources, characteristics & disposal methods (Scientific land filling, composting, recycling and reuse)

Water Chemistry: Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages -scale and sludge formation, boiler corrosion (due to dissolved O_2, CO_2 and MgC_{12}). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry). Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis

(RBT Levels: L3)

Module V
Instrumental methods of analysis and Nanomaterials

Instrumental methods of analysis: Theory, Instrumentation and applications of Colorimetry, Flame Photometry, Atomic Absorption Spectroscopy, Potentiometry, Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base)

Nanomaterials: Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition, Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications

(RBT Levels: L1 & L2)

Course Outcomes: On completion of this course, students will have knowledge in:

CO1 : Use of free energy in equilibria, rationalize bulk properties and processes using thermodynamic considerations, electrochemical energy systems.

CO2 : Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electroless plating.

CO3 : Production & consumption of energy for industrialization of country and living standards of people. Electrochemical and concentration cells. Classical, modern batteries and fuel cells. Utilization of solar energy for different useful forms of energy.

CO4 : Environmental pollution, waste management and water chemistry.

CO5 : Different techniques of instrumental methods of analysis. Fundamental principles of nano materials.

Question Paper Pattern:

- **The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 60.**
- The question paper will have **ten** full questions carrying equal marks.
- Each full question carries **20** marks.
- There will be **two** full questions (with a **maximum** of **three** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Textbooks:

1. P.C. Jain & Monica Jain. **"Engineering Chemistry"**, Dhanpat Rai Publications, New Delhi (2015- Edition).

2. S. S. Dara, A textbook of Engineering Chemistry, 10th Edition, S Chand & Co., Ltd., New Delhi, 2014.

3. Physical Chemistry, by P. W. Atkins, Oxford Publications (Eighth edition-2006).

Reference books:

1. O.G. Palanna, **"Engineering Chemistry"**, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint (2015- Edition).

2. R.V. Gadag & A. Nityananda Shetty., **"Engineering Chemistry"**, I K International Publishing House Private Ltd. New Delhi (2015- Edition).

3. **"Wiley Engineering Chemistry"**, Wiley India Pvt. Ltd. New Delhi. Second Edition-2013.

4. B. Jaiprakash, R. Venugopal, Sivakumaraiah and Pushpa Iyengar, Chemistry for Engineering Students, Subhash Publications, Bengaluru, (2015- Edition).

C PROGRAMMING FOR PROBLEM SOLVING

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CPS13/23	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
	Credits : 03		

Course Learning Objectives:

This course **(18CPS13/23)** will enable students to:

- Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
- Implement different programming constructs and decomposition of problems into functions.
- Use and implement data structures like arrays and structures to obtain solutions.
- Define and use of pointers with simple applications.

MODULE-I

Introduction to computer Hardware and software: Computer generations, computer types, bits, bytes and words, CPU, Primary memory, Secondary memory, ports and connections, input devices, output devices, Computers in a network, Network hardware, Software basics, software types.

Overview of C: Basic structure of C program, executing a C program. Constant, variable and data types, Operators and expressions,

(RBT Levels : L1 & L2)

MODULE 2

Managing Input and output operations. Conditional Branching and Loops. Example programs, Finding roots of a quadratic equation, computation of binomial coefficients, plotting of Pascals triangle.

(RBT Levels : L1 & L2)

MODULE 3

Arrays: Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching and Sorting Algorithms (Linear search, Binary search, Bubble sort and Selection sort).

(RBT Levels : L1, L2 & L3)

MODULE 4

User Defined Functions and Recursion.
Example programs, Finding Factorial of a positive integers and Fibonacci series.

(RBT Levels : L1, L2 & L3)

MODULE 5

Structure and Pointers, Preprocessor Directives

(RBT Levels : L1, L2 & L3)

Course Outcomes:
The student will be able to :
- Illustrate simple algorithms from the different domains such as mathematics, physics, etc.
- Construct a programming solution to the given problem using C.
- Identify and correct the syntax and logical errors in C programs.
- Modularize the given problem using functions and structures.

Question Paper Pattern:
- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:
1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-Hill
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

Reference Books:
1. Sumitabha Das, Computer Fundamentals & C Programming, Mc Graw Hill Education.
2. Gary J Bronson, ANSI C Programming, 4th Edition, Ceneage Learning.
3. Dey and Ghosh, Programming in C, 3rd Edition, Oxford University Press.
4. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
5. R S Bichkar, Programming with C, University Press, 2012.
6. V Rajaraman: Computer Programming in C, PHI, 2013.
7. Basavaraj S. Anami, Shanmukhappa A Angadi, Sunilkumar S. Manvi, Computer Concepts and C Programming: A Holistic Approach to Learning C, Seond edition, PHI India, 2010.

BASIC ELECTRONICS

Semester	: I/II	CIE Marks	: 40
Course Code	: 18ELN14/24	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
	Credits : 03		

Course Objectives:

This course will enable students to:
- Understand characteristics, operation and applications of the diodes, bipolar junction transistors, field effect transistors, SCRs and operational amplifiers in electronic circuits.
- Understand different number systems and working of fundamental building blocks of digital circuits.
- Understand the principle of basic communication system and mobile phones.

MODULE-1

Semiconductor Diodes and Applications:

p-n junction diode, Equivalent circuit of diode, Zener Diode, Zener diode as a voltage regulator, Rectification-Half wave rectifier, Full wave rectifier, Bridge rectifier, Capacitor filter circuit (2.2, 2.3, 2.4 of Text 1).
Photo diode, LED, Photo coupler. (2.7.4, 2.7.5, 2.7.6 of Text 1).
78XX series and 7805 Fixed IC voltage regulator (8.4.4 and 8.4.5 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-2

FET and SCR:

Introduction, JFET: Construction and operation, JFET Drain Characteristics and Parameters, JFET Transfer Characteristic, Square law expression for I_D, Input resistance, MOSFET: Depletion and Enhancement type MOSFET-Construction, Operation, Characteristics and Symbols, (refer 7.1, 7.2, 7.4, 7.5 of Text 2), CMOS (4.5 of Text 1).
Silicon Controlled Rectifier (SCR) – Two-transistor model, Switching action, Characteristics, Phase control application (refer 3.4 upto 3.4.5 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-3

Operational Amplifiers and Applications:

Introduction to Op-Amp, Op-Amp Input Modes, Op-Amp Parameters-CMRR, Input Offset Voltage and Current, Input Bias Current, Input and Output Impedance, Slew Rate (12.1, 12.2 of Text 2).

Applications of Op-Amp - Inverting amplifier, Non-Inverting amplifier, Summer, Voltage follower, Integrator, Differentiator, Comparator (6.2 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-4

BJT Applications, Feedback Amplifiers and Oscillators:

BJT as an amplifier, BJT as a switch, Transistor switch circuit to switch ON/OFF an LED and a lamp in a power circuit using a relay (refer 4.4 and 4.5 of Text 2).

Feedback Amplifiers – Principle, Properties and advantages of Negative Feedback, Types of feedback, Voltage series feedback, Gain stability with feedback (7.1-7.3 of Text 1).

Oscillators – Barkhaunsen's criteria for oscillation, RC Phase Shift oscillator, Wien Bridge oscillator (7.7-7.9 of Text 1).

IC 555 Timer and Astable Oscillator using IC 555 (17.2 and 17.3 of Text 1).

(RBT Levels : L1, L2 & L3)

MODULE-5

Digital Electronics Fundamentals:

Difference between analog and digital signals, Number System-Binary, Hexadecimal, Conversion- Decimal to binary, Hexadecimal to decimal and vice-versa, Boolean algebra, Basic and Universal Gates, Half and Full adder, Multiplexer, Decoder, SR and JK flip-flops, Shift register, 3 bit Ripple Counter (refer 10.1-10.7 of Text 1).

Basic Communication system, Principle of operations of Mobile phone (refer 18.2 and 18.18 of Text 1).

(RBT Levels : L1 & L2)

Course Outcomes:

After studying this course, students will be able to:

- Describe the operation of diodes, BJT, FET and Operational Amplifiers.
- Design and explain the construction of rectifiers, regulators, amplifiers and oscillators.
- Describe general operating principles of SCRs and its application.
- Explain the working and design of Fixed voltage IC regulator using 7805 and Astable oscillator using Timer IC 555.
- Explain the different number system and their conversions and construct simple combinational and sequential logic circuits using Flip-Flops.
- Describe the basic principle of operation of communication system and mobile phones.

Proposed Activities to be carried out for 10 marks of CIE:

Students should construct and make the demo of the following circuits in a group of 3/4 students:

1. +5V power supply unit using Bridge rectifier, Capacitor filter and IC 7805.
2. To switch on/off an LED using a Diode in forward/reverse bias using a battery cell.
3. Transistor switch circuit to operate a relay which switches off/on an LED.
4. IC 741 Integrator circuit/ Comparator circuit.
5. To operate a small loud speaker by generating oscillations using IC 555.

Question paper pattern:

*   Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
*   Each full question can have a maximum of 4 sub questions.
*   There will be 2 full questions from each module covering all the topics of the module.
*   Students will have to answer 5 full questions, selecting one full question from each module.
*   The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Textbooks:

1. D.P.Kothari, I.J.Nagarath, "Basic Electronics", 2nd edn, Mc Graw Hill, 2018.
2. Thomas L. Floyd, "Electronic Devices", Pearson Education, 9th edition, 2012.

Reference Books:

1. D.P.Kothari, I.J.Nagarath, "Basic Electronics", 1st edn, Mc Graw Hill, 2014.
2. Boylestad, Nashelskey, "Electronic Devices and Circuit Theory", Pearson Education, 9th Edition, 2007/11th edition, 2013.
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
4. Muhammad H. Rashid, "Electronics Devices and Circuits", Cengage Learning, 2014.

ELEMENTS OF MECHANICAL ENGINEERING

Semester	: I/II	CIE Marks	: 40
Course Code	: 18ME15/25	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
	Credits : 03		

Course Objectives:

This course **(18ME15/25)** will enable students to
CLO1   Learn the fundamental concepts of energy, its sources and conversion.
CLO2   Comprehend the basic concepts of thermodynamics.
CLO3   Understand the concepts of boilers, turbines, pumps, internal combustion engines and refrigeration
CLO4   Distinguish different metal joining techniques.
CLO5   Enumerate the knowledge of working with conventional machine tools, their specifications.

MODULE-1

Sources of Energy : Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion.

Basic concepts of Thermodynamics: Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numericals).

Steam: Formation of steam and thermodynamic properties of steam (simple numericals).

(RBT : L1, L2 & L3)

MODULE-II

Boilers: Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).

Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitation and priming.

(RBT: L1, L2 & L3)

MODULE – III

Internal Combustion Engines

Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.

Refrigeration and Air conditioning

Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners.

(RBT Levels : L1, L2 & L3)

MODULE IV

Properties, Composition and Industrial Applications of engineering materials

Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass, optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.

Joining Processes: Soldering, Brazing and Welding

Definitions. Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.

Belt drives

Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.

Gear drives

Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.

(RBT Levels : L1, L2 & L3)

MODULE-V

Lathe - Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.

Milling Machine - Principle of milling, types of milling machines. Working of horizontal and vertical milling machines. Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.

(Layout sketches of the above machines need not be dealt. Sketches need to be used only for explaining the operations performed on the machines)

Introduction to Advanced Manufacturing Systems
Computer Numerical Control (CNC): Introduction, components of CNC, open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning centers.
Robots: Robot anatomy, joints and links, common robot configurations.
Applications of Robots in material handling, processing and assembly and inspection.

(RBT Levels : L1, L2 & L3)

Course Outcomes:

Upon completion of this course, students will be able to

CO1   Identify different sources of energy and their conversion process.

CO2   Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration.

CO3   Recognize various metal joining processes and power transmission elements.

CO4   Understand the properties of common engineering materials and their applications in engineering industry.

CO5   Discuss the working of conventional machine tools, machining processes, tools and accessories.

CO6   Describe the advanced manufacturing systems.

Question paper pattern:

- **The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.**
- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **20** marks.
- There will be **two** full questions (with a **maximum** of **three** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Note

- To illustrate the concepts of operations of turbines, pumps, conventional machines like lathe, drilling, milling, grinding etc., the instructions should be blended with video presentations and visit to the laboratories/ machine shop concerned.
- Demonstration of soldering, brazing and welding should be arranged in the workshop.
- To illustrate the fundamentals of CNC machining and turning centers and robots, video presentations should be adapted in addition to class room instructions.
- The boiler mountings and accessories should be shown in the engine lab.

- Assignments should be submitted by students on materials, sources of energy, global warming, welding processes, robots and their applications. These assignments should be given due credit in awarding CIE marks.

Textbooks :
1. **Elements of Mechanical Engineering,** K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
2. **Elements of Mechanical Engineering,** Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.
3. **A Text Book of Elements of Mechanical Engineering",** S. Trymbaka Murthy, 3rd revised edition 2006, I .K. International Publishing House Pvt. Ltd., New Delhi.

Reference Books :
1. **Elements of Mechanical Engineering,** R.K. Rajput, Firewall Media, 2005.
2. **Elements of Mechanical Engineering,** Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.
3. **CAD/CAM/CIM,** Dr. P Radhakrishnan, 3rd edition, New Age International Publishers, New Delhi.
4. **Introduction to Robotics: Mechanics And Control,** Craig, J. J., 2nd Ed.Addison-Wesley Publishing Company, Readong, MA, 1989.
5. **Introduction to Engineering Materials",** B.K. Agrawal ,Tata McGraHill Publication, New Delhi.
6. **Thermal Science and Engineering",** Dr. D.S. Kumar, S.K. Kataria & sons Publication, New Delhi.

ENGINEERING CHEMISTRY LABORATORY

Semester	: I/II	**CIE Marks**	: 40
Course Code	: 18CHEL16/26	**SEE Marks**	: 60
Teaching Hours/week (L:T:P)	: 0:0:2	**Exam Hours**	: 03
	Credits : 01		

Course Objectives:
To provide students with practical knowledge of
•   Quantitative analysis of materials by classical methods of analysis.
•   Instrumental methods for developing experimental skills in building technical competence.

Instrumental Experiments
1.   Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.
2.   Conductometric estimation of acid mixture.
3.   Determination of Viscosity co-efficient of the given liquid using Ostwald's viscometer.
4.   Colorimetric estimation of Copper.
5.   Determination of pKa of the given weak acid using pH meter.
6.   Flame photometric estimation of sodium and potassium.

Volumetric Experiments
1.   Estimation of Total hardness of water by EDTA complexometric method.
2.   Estimation of CaO in cement solution by rapid EDTA method.
3.   Determination of percentage of Copper in brass using standard sodium thiosulphate solution.
4.   Determination of COD of waste water.
5.   Estimation of Iron in haematite ore solution using standard $K_2Cr_2O_7$ solution by external indicator method.
6.   Estimation of percentage of available chlorine in the given sample of bleaching powder (Iodometric method)

Course Outcomes:
On completion of this course, students will have the knowledge in,
CO1:   Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
CO2:   Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

Conduction of Practical Examination :

1. Examination shall be conducted for 100 marks, later reduced to 60 marks.
2. All experiments are to be included for practical examination.
3. One instrumental and another volumetric experiment shall be set.
4. Different experiments shall be set under instrumental and a common experiment under volumetric.

Reference Books :

1. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis".
2. O.P. Vermani & Narula, "Theory and Practice in Applied Chemistry", New Age International Publishers.
3. Gary D. Christian, "Analytical chemistry", 6th Edition, Wiley India.

C PROGRAMMING LABORATORY

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CPL17/27	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 0:0:2	Exam Hours	: 03
	Credits : 01		

Course Learning Objectives:

This course **(18CPL17/27)** will enable students to:
* Write flowcharts, algorithms and programs.
* Familiarize the processes of debugging and execution.
* Implement basics of C programming language.
* Illustrate solutions to the laboratory programs.

Descriptions (if any):

* The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm being implemented or implemented for the problems given.
* Note that experiment 1 is mandatory and written in the journal.
* Questions related with experiment 1, need to be asked during viva-voce for all experiments.
* Every experiment should have algorithm and flowchart be written before writing the program.
* Code should be traced using minimum two test cases which should be recorded.
* It is preferred to implement using Linux and GCC.

Laboratory Programs:

1. Familiarization with computer hardware and programming environment, concept of naming the program files, storing, compilation, execution and debugging, taking any simple C- code.

PART A

2. Develop a program to solve simple computational problems using arithmetic expressions and use of each operator leading to simulation of a commercial calculator. (No built-in math function)
3. Develop a program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
4. Develop a program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages.

5. An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges.

6. Introduce 1D Array manipulation and implement Binary search.

7. Implement using functions to check whether the given number is prime and display appropriate messages. (No built-in math function)

PART B

8. Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.

9. Develop a Program to compute Sin(x) using Taylor series approximation. Compare your result with the built- in Library function. Print both the results with appropriate messages.

10. Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.

11. Develop a program to sort the given set of N numbers using Bubble sort.

12. Develop a program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don't use library function sqrt(n).

13. Implement structures to read, write and compute average- marks and the students scoring above and below the average marks for a class of N students.

14. Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.

15. Implement Recursive functions for Binary to Decimal Conversion.

Laboratory Outcomes:

The student should be able to:

• Write algorithms, flowcharts and program for simple problems.

• Correct syntax and logical errors to execute a program.

• Write iterative and wherever possible recursive programs.

• Demonstrate use of functions, arrays, strings, structures and pointers in problem solving.

Conduct of Practical Examination:

• All laboratory experiments, excluding the first, are to be included for practical examination.

• Experiment distribution

   o   For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.

o   For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.

- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution (Subjected to change in accordance with university regulations)

a)   For questions having only one part – Procedure + Execution + Viva-Voce: $15+70+15 = 100$ Marks

b)   For questions having part A and B
   i.   Part A – Procedure + Execution + Viva $= 4 + 21 + 5 = 30$ Marks
   ii. Part B – Procedure + Execution + Viva $= 10 + 49 + 11 = 70$ Marks

TECHNICAL ENGLISH - II

Semester	: II	CIE Marks	: 40
Course Code	: 18EGH28	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 0:2:0	Exam Hours	: 03
	Credits : 01		

Course Objectives:

The course Technical English – II will enable the students,

- To implement English vocabulary at command and ensure language proficiency
- To Achieve better Technical writing and Presentation skills
- Identify the common errors in speaking and writing English
- Acquire Employment and Workplace communication skills

Language Lab

For augment LSRW and GV skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred.

Module - I
Identifying Common Errors in Writing and Speaking English

Subject Verb Agreement (Concord Rules with Exercises), Common errors in Subject-verb agreement, Noun-pronoun agreement, Adjective, Adverb, Verb, Sequence of Tenses, Misplaced modifiers, Articles and Prepositions, Common errors in Conjunctions, Word Order, Errors due to the Confusion of words, Common errors in the use of Idioms and phrases, Gender, Singular & Plural.

(RBT Levels : L1, L2 & L3)

Module - II
Nature and Style of sensible writing

Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, The Art of Condensation (Precise writing) and Techniques in Essay writing, Common Errors due to Indianism in English Communication, Redundancies & Clichés.

(RBT Levels : L1, L2 & L3)

Module - III
Technical Reading and Writing Practices

Effective Technical Reading and Writing Practices, Technical Reports writing and Technical Proposals Writing.
Grammar – Voice (Active and Passive Voices) and Reported Speech, Vocabulary – Anologies, Words Confused/Misused, Collocations. The

Listening Comprehension, Spotting Error Exercises, Sentence Improvement Exercises, Cloze Test and Theme Detection Exercises.

(RBT Levels : L1, L2 & L3)

Module - IV
Communication for Employment

Components of a Formal Letter, Formats and Types of Business Letters, Model Letter of Application (Cover Letter) with Resume, Email and Blog Writing, Reading Skills and Reading Comprehension.

(RBT Levels : L1, L2 & L3)

Module - V
Communication at Workplace

Interpersonal Communication Skills, Non-Verbal Communication Skills (Body Language), Group Discussion and Employment Interviews, Presentation skills and Formal Presentations by Students, Dialogues in Various Situations (Practical Sessions by Students).

(RBT Levels : L1, L2 & L3)

Course Outcomes:

On completion of the course, students will be able to,

CO 1: Identify common errors in spoken and written communication

CO 2: Get familiarized with English vocabulary and language proficiency

CO 3: Improve nature and style of sensible writing and acquire employment and workplace communication skills

CO 4: Improve their Technical Communication Skills through Technical Reading and Writing practices

CO 5: Perform well in campus recruitment, engineering and all other general competitive examinations

Question paper pattern :

The SEE question paper will be set for 100 marks and the pattern of the question paper will be objective type (MCQ).

Textbooks :

1. **Technical Communication** by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] - 2018.
2. **Communication Skills** by Sanjay Kumar and Pushp Lata, Oxford University Press - 2018. **Refer it's workbook** for activities and exercises – "Communication Skills – II (A Workbook)" published by Oxford University Press – 2018.

Reference Books :

1. **High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.

2. **English Language Communication Skills – Lab Manual cum Workbook,** Cengage learning India Pvt Limited [Latest Revised Edition] – 2018.

3. **Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.

4. **Effective Technical Communication** – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private Limited – 2018.

5. **Intermediate Grammar, Usage and Composition** by M.L.Tichoo, A.L.Subramanian, P.R.Subramanian, Orient Black Swan – 2016.