**Department – Applied Science**

HANDBOOK

Bachelor of Technology

Semester: 2nd

(All Branches)

Academic Session:Jan-May 2016

****

**ASRA College of Engineering & Technology….Vision towards success**

**Patiala – Sangrur Highway, Bhawanigarh, Distt. - Sangrur (Punjab)**

**Faculty of Applied Science**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no** | **Name of the faculty member** | **Designation** | **Contact No.** | **E-mail id** |
| 1  | Ms. Dimple Chawla | A.P. in Mathematics | 91-9988640330 | **asrahodappliedscience@gmail.com** |
| 2 | Ms. Priyanka  | A.P. in Pyhsics | 91-9569817433 | **asraascif3@gmail.com** |
| 3 | Ms. Navpreet Kaur | A.P.in Chemistry | 91-9915328480 | **asraecenavpreet90@gmail.com** |
| 4 | Ms. Parveen Khokhar | A.P. in Comm. Skills | 91-9915734579 | **asraascif2@gmail.com** |

**Faculty of Other Department**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no** | **Name of the faculty member** | **Designation** | **Contact No.** | **E-mail id** |
|  | Prof. Sandeep Sharma | Director ACET | 91-9592800327 | **asrahodme@gmail.com** |
|  | Er. Omesh Jindal | A.P. in M.E. | 91-9465354827 | **asramef1@gmail.com** |
|  | Er. Navjor Kaur | A.P. in CSE | 91-8427752347 | **asracsef10@gmail.com** |
|  | Ms. Veerpal kaur | A.P. in MCA Deptt. | 91-7837030109 | **veeruppal13@gmail.com** |
|  | Er. Gurpreet Singh | A.P. in ME | 91-9463616183 | **asramef5@gmail.com** |

**INDEX**

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Contents** | **Pages** |
| 1. | Study Scheme | 3 |
| 2. | Engineering Chemistry-syllabus , assignments, tutorial sheets  | 4-7 |
| 3. | Engineering Mathematics-II-syllabus , assignments, tutorial sheets | 8-10 |
| 4. | Elements of Mechanical -syllabus , assignments | 11-14 |
| 5. | Fundamentals of Computer Programming and IT -syllabus , assignments | 15-17 |
| 6. | Environmental Science-syllabus , assignments | 17-18 |
| 7. | Engineering Chemistry Laboratory | 19 |
| 8. | Engineering Drawing | 20-21 |
| 9. | Fundamentals of Computer Programming and IT Laboratory | 21-24 |
| 10. | Engineering Computer Graphics Laboratory | 24-25 |

**STUDY SCHEME**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Name** | **L** | **T** | **P** | **Internal** | **External** | **Total** | **Credits** |
| BTCH101 | Engineering Chemistry | 3 | 1 | - | 40 | 60 | 100 | 4 |
| BTAM102 | Engineering Mathematics-II | 4 | 1 | - | 40 | 60 | 100 | 5 |
| BTME101 | Elements of Mechanical | 4 | 1 | - | 40 | 60 | 100 | 5 |
| BTCS 101 | Fundamentals of Computer Programming and IT | 3 | - | - | 40 | 60 | 100 | 3 |
| EVSC 101 | Environmental Science | 2 | 0 | - | 40 | 60 | 100 | 2 |
| BTCH102 | Engineering ChemistryLaboratory | - | - | 2 | 30 | 20 | 50 | 1 |
| BTME102 | Engineering Drawing | 1 | - | 6 | 40 | 60 | 100 | 4 |
| BTCS 102 | Fundamentals of Computer Programming and ITLaboratory | - | - | 4 | 30 | 20 | 50 | 2 |
| BTME103 | Engineering Computer Graphics Laboratory | - | - | 2 | 30 | 20 | 50 | 1 |
| Total | Total 6Theory Courses + 3 Laboratory Courses | 17 | 3 | 14 | 320 | 380 | 750 | 27 |

**B. Tech. Second Semester (Chemistry Group)**

**SYLLABUS**

**BTCH101 Engineering Chemistry**

**PART A**

**1. Spectroscopy and its Applications: An introduction**

* UV/Visible Spectroscopy: Selection rules; Line widths and intensity of spectral lines; Principle and instrumentation; Electronic Transitions Chromophores&auxochromes; Factors affecting λMax& intensity of spectral lines; Franck-Condon principle; Applications.
* IR Spectroscopy: Principle and instrumentation; Vibrational frequency; Fundamental modes of vibrations and types; Anharmonics; Factors affecting vibrational frequency; Applications.
* NMR Spectroscopy: Principle & instrumentation; Chemical shift; Spin-Spin Splitting; High resolution NMR spectrum (PMR only).

**2. Photochemistry:**

 Introduction; Photo-physical & photochemical processes; Light sources in photochemistry; Beer-Lambert Law; Laws of Photochemistry; Quantum yield (primary and overall); Primary and secondary photochemical reactions;Jablonski diagram; Semiconductor photochemistry, Photovoltaic cells, Introduction to optical sensors, Introduction to supra-molecular photochemistry.

**3. Water and its Treatment:**

Boiler feed water: Specification, Scales and sludge fermentation; Priming &foaming; Different methods of the water purifications and softening;Desalination of water; Water for domestic use: Specification; Disinfection of water.

**4. Green Chemistry and its Applications:**

Introductory overview - Definition and concepts of Green chemistry; Emergence of Green chemistry; Twelve principles of Green Chemistry with emphasis on the use of alternative feedstock (bio-fuels); Use of innocuous reagents in natural processes; Alternative solvents; Design of the safer chemicals; Designing alternative reaction methodology. Microwave and ultrasonic radiation in Green synthesis - Minimizing energy consumption.

**PART B**

**5. Corrosion and its Prevention:**

Introduction; Different types of corrosion - Wet and Dry corrosion; Different types of surface films; Mechanisms of wet corrosion; Galvanic corrosion; Galvanic Series; Concentration cell corrosion and differential aeration corrosion; Soil and microbial corrosions; waterline, stress corrosions; Various methods of corrosion control.

**6. Polymers and Reinforced Composites:**

Introduction; Functionality; Types of polymerization; Specific features of polymers; Structures - regularity and irregularity; Tacticity of polymers; Average molecular weights and size; Determination of molecular weight by number average method; Effect of molecular weight on the properties of polymers; Introduction to polymer reinforced composite.

**7. Nanochemistry:**

Introduction; Materials self-assembly; Moloecular vs. materials self-assembly; Self-assembling materials; Two dimensional assemblies; Mesoscale self assembly; Coercing colloids; Nanocrystals; Superamolecular structures; Nanoscale materials; Future perspectives.

**8. Petrochemicals:**

Introduction; First, second & third generation petrochemicals; Primary Raw Materials for Petrochemicals.Natural gas: Natural gas treatment processes; Natural gas liquids; Properties of natural gas; Crude oil: Composition of crude oil- Hydrocarbon compounds;Non-hydrocarbon compounds; Metallic Compounds, Crude oil classification; Physical separation processes; Conversion processes; Production of ethylene and propylene.

**ASSIGNMENTS**

**Assignment no. 1**

1.What is Corrosion?

2.What is a mechanism of Wet corrosion.

3.What do you understand by Galvanic corrosion.

4.What is corrosion of metal? Explain Different types of corrosion.

5.What are the different methods of corrosion control.

**Assignment no.2**

1.What is Photochemistry?

2.Give difference between Photochemical and thermal reactions.

3.State Beer- Lambert Law. Write a note on

 a) laws of photochemistry b)Quantum efficiency

4.Write a note on

a)Grotthus Draper Law b)Stark Einstein Law

5.Draw well labeled jablonski diagram .Discuss non- radiative transitions.

6.What are Photovoltic cells**.**

**Assignment no.3**

1.Define atom economy.

2.What is Green Chemistry?Why is it called so?

3.Explain twelve principles of Green chemistry.

4.What is meant by polymerization?

5.Define Composite.

6.What is the significance of determination of molecular weight of a polymer.

7.What is cross linked polymer.

8.Write a short note on addition polymerization and condensation polymerization.

**Assignment no.4**

1.What is Nanochemistry?

2.Definenano science and nano technology?

3.Write a note on supramolecular structures.

4.Give the applications of nano chemistry.

5.What are petrochemical products?

6.Expalin the production of etyylene and propylene by steam cracking of hydrocarbons. 7.What are the properties of natural gas?

**TUTORIAL SHEETS**

**Tutorial Sheet. 1**

1.Calculate temporary hardness and total hardness of a sample of water containing-Mg(HCO3)2=7.3 mg/l, Ca(HCO3)2=16.2mg/l ,MgCl2= 9.5 mg/l and CaSO4=13.6mg/l.

2.A sample of water on analysis has been found to contain following in ppm:

Ca(HCO3)2=10.5,mg(HCO3)2=12.5,CaSO4=7.5,CaCl2=8.2,MgSO4=2.6.calculate the temporary and permanent hardness of water

3.A sample of water has the following impurities in mg/l.find the temprorary and permanent hardness in ppm.Ca(HCO3)2=10.00,Mg(HCO3)=8.0,cAso4=12.0

4.Calculate the amount of lime and soda required for softening of 15000l of water which is analysed as follows:

Temporary hardness=20ppm

Permanent hardness =15ppm

Permanent Mg hardness=10ppm

5.Calculate the amount of lime and soda required for softening of 25000 l of water which was analysed as follows:

Ca(HCO3)2=4.86PPM,Mg(HCO3)2=7.30ppm,CaSO4=6.80ppm,MgCl2=5.70ppm,MgSO4=9.00ppm,SiO2=3.50ppm,NaCl=5.85ppm.

**Tutorial Sheet. 2**

1.Calculate the value of an Einstein of energy in Kcal for radiation of wavelength 4000A. 2.If the value of Einstein is 72Kcal,calculate the wavelength of light in cm.

3.Calculate energy of one photon of light of wave length 2450A will it be able to dissociate a bond in diatomic molecule which absorbs this photon and has a bond energy equal to 95cal/mole.

4.Monochromatic radiation of 400nm wavelength produced by Laser is completely absorded by a reaction mixture.if the intensity of radiation is 50 W, How many moles of photons are absorbed in 10 minutes.

5.Calculate the energy per mple of light having wavelength of 85nm,300nm

**SYLLABUS**

**BTAM102 Engineering Mathematics-II**

**PART A**

**1. Ordinary Differential Equations of first order:** Exact Differential equations, Equations reducible to exact form by integrating factors; Equations of the first order and higher degree. Clairaut’s equation. Leibniz's linear and Bernoulli's equation

**2. Linear Ordinary Differential Equations of second & higher order**: Solution of linear Ordinary Differential Equations of second and higher order; methods of finding complementary functions and particular integrals. Special methods for finding particular integrals: Method of variation of parameters, Operator method. Cauchy's homogeneous and Legendre's linear equation, Simultaneous linear equations with constant coefficients.

**3. Applications of Ordinary Differential Equations**: Applications to electric R-L-C circuits, Deflection of beams, Simple harmonic motion, Simple population model.

**PART B**

**4. Linear Algebra:**Rank of a matrix, Elementary transfonnations, Linear independence and dependence of vectors, Gauss-Jordan method to find inverse of a matrix, reduction to normal form, Consistency and solution of linear algebraic equations, Linear transformations, Orthogonal transformations, Eigen values,Eigen vectors, Cayley-Hamilton Theorem, Reduction to diagonal form, orthogonal, unitary, Hermitian and similar matrices.

**5. Infinite Series:** Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Rabee's test, Logarithmic test, Cauchy's root test and Gauss test. Convergence and absolute convergence of alternating series

**6. Complex Numbers and elementary functions of complex variable**: De-Moivre's theorem and its applications. Real and Imaginary parts of exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of trigonometric series. (C+iS method)

**ASSIGNMENTS**

 **Assignment 1**

**Topic :- Ordinary differential equations of first order .**

1. Solve dy = sin(x+y)

 dx

1. Solve x cosx cosy+ siny dy =0

 dx

1. Find the general solution of the differential equation

(2xy+x2) y1= 3y2+2xy

1. Solve (sex tanx tany- ex) dx+ sec x sec2y dy =0
2. Solve (1+y2) dx = (tan1y-x) dy
3. solve dy =x sin2y = x3 cos2y

 dx

**Assignment 2**

**Topic : Differential equations of second and higher order.**

1. solve d2y + 4y = x sin2x

 dx2

1. solve (D-2)2y =8 (e2x+sin2x+x2)
2. solve d2y - 2dy + y = xex sinx

 dx2 dx

1. solve y”-6y’+9y= e3x x-2 by variation of parameter method
2. solve xy” +xy’= logx sin (logx)
3. solve dx +2y=et and dy - 2x= e-t

 dt dt

1. solve dx +4x+3y = t and dy +2x+5y = et

 dt dt

**Assignment.3**

**Topic matrix (In linear algebra)**

1. Find the rank of the following matrices
2. 1 4 5

 2 6 8

 3 7 22

ii. Diag matrix [-1 0 1 0 0 4]

1. using matrix method, show that the equations

3x+3y+2z=1, x+2y=4, 10y+3z=-2, 2x-3y-z=5 are consistent and hence obtain the solution for x,y and z.

1. If ƛ is an eigen value of the matrix A, then prove that g(ƛ) is an eigen value of g(A), where g is polynomial.
2. Cayley Hamilton theorem.
3. using cayley Hamilton theorem, find the inverse of

 2 5 3

 3 1 2

 1 2 1

 6. Prove that the following matrix is orthogonal.

 1 2 2

 2 1 -2

 2 -2 1

**Assignment. 4**

**Topic:- Infinite series**

1. convergent and divergent of sequence.
2. comparison test
3. Ration test, logarithmic test
4. Cauchy integral test
5. Test the convergence of the series

**∞**

**Ʃ 8 tanˉˡ n/ 1+n2**

**n=1**

1. Test the convergence.

 **∞**

 **(a) Ʃ 1/ (**logn)n (b) **Ʃ (1+1/n)-n2**

n=1

1. Discuss the convergence of the following series

 1+ 2p/2! + 3p/3! +4p/4! +……….(p>0)

**Assignment 5**

**Topic:- complex number and elementary function**

1. De-Movri's theorem.
2. Simplify cosθ +i sinθ

 sinθ + i cosθ

1. if x+ 1 + 2 cosθ, y+1=2cosɸ, prove that one of the values of

 x  y

1. xm + yn is 2cos (mθ-nɸ)

 yn xm

1. Find the values of(-1) 1/6
2. if (3+x)3 -(3-x)3=0 than prove that x=3 itam rΠ

 r=0,1,2 3

1. Expand cos5θ sin7θ in a series of sines of multiples of θ
2. Express log (logi) in the form A+iB.
3. Find modules and arrangement of (1+i)1-i
4. Separate into real and imaginary parts log sin(x+iy)

**SYLLABUS**

**BTME101 ELEMENTS OF MECHANICAL ENGG.**

**1.Basic Concepts of Thermodynamics**

Definition of thermodynamic: Need to study thermodynamics; Application areas of thermodynamic; Difference between Microscopic (or, Statistical) thermodynamics and Macroscopic(or, Classical) thermodynamics; Brief concept of continuum; Thermodynamic System : definition, types (Open, Closed and Isolated) and their examples; Thermodynamic System Boundary : definition, types and their examples; Surroundings; Control(fixed) mass and Control Volume concept and their example ; Thermodynamic State; Thermodynamic Property: definition, types citing their examples; condition for any quantity to be a property; State postulate; Thermodynamic equilibrium (which includes Thermal, Mechanical and Chemical equilibrium etc.); Thermodynamic path; Thermodynamic process: definition, concept of reversible process, quasi-static (or, quasi-equilibrium) process, irreversible process, conditions for reversibility and how these are met with, non-flow processes and flow processes, method of representation of reversible and irreversible process on property diagrams; Cyclic process; Thermodynamic Cycle: definition and its concept; Energy and its forms (microscopic and macroscopic); Physical insight to internal energy; Energy transfer across system boundary i.e. transient energies (heat and work) Difference between heat and work; Sign conventions for heat and work interactions; heat and work as path functions; Equality of Temperature and Zeroth law of Thermodynamics.

**2.First Law of Thermodynamics and its applications**

Definition, essence and corollaries or consequences of first law of Thermodynamics; Expressions for First law of Thermodynamics for a control mass undergoing a Cycle and for process (i.e., a change in state of a control mass) ; Concept of Enthalpy and total energy and differentiation between the two – a thermodynamic property; Compressible and incompressible substances, Specific heats, Difference between Internal Energy and Enthalpy of compressible and incompressible substances; Representation of first law of thermodynamics as rate equation; Analysis of non-flow/ flow process for a control mass undergoing constant volume, constant pressure, constant temperature, adiabatic and polytropic processes; Free Expansion Process and its examples, its representation on Property diagram; Review of concepts of control volume; Expressions of first law of thermodynamics for a control volume (i.e. open system) ; Steady State Steady Flow process and its examples; First law analysis of Steady State Flow process e.g. isochoric, isobaric, isothermal, isentropic and polytropic process; Throttling process and its applications; Flow energy or inertial energy of flowing fluids or, Energy transport by mass; Application of Steady State Flow Energy Equation to various engineering devices.

**3.Second Law of Thermodynamics**

Limitations of first law of thermodynamics; and how 2nd law is fully able to explain away and thus overcome those shortcomings of Ist law; Thermal Reservoirs, source and sink (Low temperature and high temperatures); Heat Engine, Heat Pump and Refrigerator: definitions, working, efficiency/performance and their real life examples. Justification as to why the actual efficiency of Heat Pump and Refrigerator shall also be ≤ 100% though on the face of it seems to be more than 100%; Various statements of Second Law of Thermodynamics and their equivalence; Philosophy of Carnot cycle and its consequences viz. how each of the individual four processes constituting the cycle contribute in optimizing the output an efficiency of the cycle; Carnot Engine, Carnot Refrigerator and Carnot Heat Pump: definitions, working, efficiency/performance and Limitations of the cycle; Carnot theorem for heat engines, refrigerators and heat pumps; derivation of Carnot efficiency/COP (which seems to be more than 100%); Thermodynamic Temperature Scale; Clausius theorem and Inequality; Philosophy and concept of entropy; Entropy changes during various processes; Temperature - Entropy Chart and representation of various processes on it; Principle of Increase of Entropy; Applications of Entropy Principle; Quality of Energy viz. high and low grade energies; Degradation of Energy; Third Law of Thermodynamics.

**4.Gas Power Cycles**

Introduction; Concept and philosophy of Air Standard Cycle alongwith associated assumptions and advantages; Air Standard Efficiency; Nomenclature of reciprocating piston-cylinder arrangement with basic definitions such as swept volume, clearance volume, compression ratio, mean effective pressure etc; Otto Cycle (or constant volume heat addition cycle), Diesel cycle (or constant pressure heat addition cycle) and Dual cycle (Mixed or Composite or Limited Pressure cycle) with their representation on P-V and T-S charts, their Air-standard (thermal) Efficiencies; Brayton Cycle, Comparison of Otto, Diesel and Dual cycle under some defined similar parametric conditions; Introduction to heat engines; Merits of I.C. Engines and their important applications, Classification and constructional features of I.C. Engines; working of two stroke and four stroke Petrol and Diesel engines and their comparison.

**5.Engineering Materials**

Materials and Civilization, Materials and Engineering, Classification of Engineering Materials, Mechanical Properties of Materials: elasticity, plasticity, strength, ductility, brittleness, melleability, toughness, resilience, hardness, machinability, formability, weldability. Properties, Composition, and Industrial Applications of materials: metals (ferrous- cast iron, steels, stainless steels and non ferrous- Aluminum, brass, bronze ), polymers (natural and synthetic , thermoplastic and thermosetting), ceramics (glass, optical fibre glass, cements), composites ( fibre reinforced, metal matrix), smart materials (piezoelectric, shape memory, thermochromic, photochromic, magnetorheological), Conductors, Semiconductors and insulators, Organic and Inorganic materials. Selection of materials for engineering applications.

**6.Centroid, Centre of Gravity and Moment of Inertia**

Difference between centre of gravity and centroid. Determination of position of centroid of plane geometric figures of I, U, H, L, T, C, Circular and Triangular Sections. Centroid of Composite Areas.Determination of position of Centre of Gravity (CG) of regular solids viz.Right Circular Cone, Solid Hemisphere, thin Hollow Hemisphere. Area moment of inertia & mass moment of inertia, Polar moment of inertia, Parallel axes Theorem (or transfer formula), Perpendicular axes Theorem, Radius of gyration, determination of area Moment of Inertia of I, U, H, L, T, C, Circular and Triangular Sections along various axes. Mass moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their axis of symmetry and other axes.

**ASSIGNMENTS**

**ASSIGNMENT 1**

**(Basic Concepts of Thermodynamics)**

1.Explain briefly zeroth law of thermodynamics.2.Define a thermodynamic system. Differentiate between open system, closed system and an isolated system.3.When the valve of the evacuated bottle is opened, atmospheric air rushes into it. If the atmospheric pressure is 101.325 kPa, and 1.2 m3 of air (measured at atmospheric conditions) enters into the bottle, calculate the work done by the air.4.14.5 litres of gas at 172 MPa is expanded at constant pressure until its volume becomes 130.5 litres. Determine the workdone by the gas.5.1 kg of a fluid is compressed reversibly according to a law pv=0.25 where p is in bar and v is in m3 /kg. The final volume is ¼ of the initial volume. Calculate the work done on the fluid and sketch the process on a p-v diagram.

**ASSIGNMENT 2**

**(First Law of Thermodynamics and its applications)**

1.State the First law of Thermodynamics and prove that for a non-flow process, it leads to the energy equation Q = ▲U + W.2.Explain clearly the difference between a non-flow process and a steady flow process.3.1.5 kg of liquid having a constant specific heat of 2.5 kJ/kg°C is stirred in a well insulated chamber causing the temperature to rise by 15°C. Find :

(i) Change in internal energy, and

(ii) Work Done for the process.

4.12 kg of a fluid per minute goes through a reversible steady flow process. The properties of fluid at the inlet are p1= 1.4 bar, 1= 25 kg/m3 , C1= 120 m/s and u1= 920 kJ/kg and at the exit are p2= 5.6 bar, 2= kg/ m3 , C2= 180 m/s and u2= 720 kJ/kg. During the passage, the fluid rejects 60 kJ/s and rises through 60 metres. Determine : (i) the change in enthalpy (▲h) and (ii) work done during the process (W).

5.In the turbine of a gas turbine unit the gases flow through the turbine is 17 kg/s and the power developed by the turbine is 14000 kW. The enthalpies of the gas at inlet and outlet are 1200 kJ/kg and 360 kj/kg respectively, and the velocities of the gases at inlet and outlet are 60 m/s and 150 m/s respectively. Calculate the rate at which the heat is rejected from the turbine. Find also the area of the inlet pipe given that specific volume of the gases at inlet is 0.5 m3 /kg.

6.A centrifugal air compressor used in gas turbine receives air at 10 kPa and 500 K. The velocity of air leaving the compressor is 10 m/s. Neglecting the velocity at the entry of the compressor, determine the power required to drive the compressor if the mass flow rate is 15 kg/s. Take cp (air) = 1 kJ/kg K and assume that there is no heat transfer from the compressor to the surroundings.

**ASSIGNMENT 3**

**(Second Law of Thermodynamics)**

1. What is the difference between a heat engine and a reversed heat engine?2. Describe the working of a Carnot Cycle.3. Prove that entropy is a property of a system.4. A heat engine is supplied heat at the rate of 1700 kJ/min. and gives an output of 9 kW. Determine the thermal efficiency and the tare of heat rejection.5.A Carnot cycle operates between source and sink temperatures of 260 C and – 17.8 C. If the system receives 100 kJ from the source, find (i) efficiency of the system, (ii) the net work transfer, (iii) heat rejected to sink.6.Air at 15°C and 1.05 bar occupies 0.02 m3. The air is heated at constant volume until the pressure is 4.2 bar, and then cooled at constant pressure back to the original temperature. Calculate the net heat flow to or from the air and the net entropy change. Sketch the process on a T-s diagram.

**ASSIGNMENT 4**

**(Gas Power Cycles )**

1.What is an air-standard efficiency?

2.Derive expressions of efficiency in the following cases:

(i) Diesel Cycle (ii) Dual Combustion Cycle

 3.Calculate the air standard efficiency of a four stroke Otto cycle engine with the following data: Piston diameter (bore)= 137mm, Length of stroke = 130 mm and Clearance Volume = 0.00028 m3 . Calculate the clearance as a percentage of swept volume.

4.1 kg of air is taken through a Diesel cycle. Initially the air is at 15°C and 1 ata. The compression Ratio is 15 and the heat added is 1850 kJ. Calculate : (i) the ideal efficiency, (ii) the mean effective pressure.

5.The compression ratio of a Dual cycle is 10. The temperature and pressure at the beginning of the cycle are 1 bar and 27C. The maximum pressure of the cycle is limited to 70 bar and heat supplied is limited to 675 kJ/kg of air. Find the thermal efficiency of the cycle.

**ASSIGNMENT 5(Engineering Materials & Centroid, Centre of Gravity and Moment of Inertia)**

1.List down all the mechanical properties of materials. Explain them.

2.What is criteria for the selection of materials for engineering applications.

3. An I section consists of top flange of size 60 x 10 mm, web 90 x 10 mm and bottom flange 100 x 20 mm. Find the position of C.G. from the bottom and calculate Ixx and Iyy.

4.Explain Parallel axis theorem and perpendicular axis theorem.

**SYLLABUS**

**Fundamentals of Computer Programming and IT**

**PART A (Fundamentals of Computer and IT) (25%)**

**1. Introduction to Computers**

Define a Computer System, Block diagram of a Computer System and itsworking, associated peripherals, memories, RAM, ROM, secondary storage devices, Computer Software and Hardware.

**2. Working Knowledge of Computer System**

Introduction to the operating system, its functions and types, working knowledge of GUI based operating system, introduction to word processors and its features, creating, editing, printing and saving documents, spell check, mail merge, creating power point presentations, creating spreadsheets and simple graphs, evolution of Internet and its applications and services

**3. Problem Solving & Program Planning**

Need for problem solving and planning a program; program design tools – algorithms, flow charts, and pseudocode; illustrative examples.

**PART B (Basics of Programming Using C++) (75%)**

**4. Overview of C++ Language**

Introduction to C++ language, structure of a C++ program, concepts of compiling and linking, IDE and its features; Basic terminology - Character set, tokens, identifiers, keywords, fundamental data types, literal and symbolic constants, declaring variables, initializing variables, type modifiers.

**5. Operators and expressions**

Operators in C++, precedence and associativity of operators, expressions and their evaluation, type conversions**.**

**6. Beginning with C++ program**

Input/output using extraction (>>) and insertion (<<) operators, writing simple C++ programs, comments in C++, stages of program execution.

**7. Control Structures**

Decision making statements: if, nested if, if – else. Else if ladder, switch, Loops and iteration: while loop, for loop, do – while loop, nesting of loops, break statement, continue statement, goto statement, use of control structures through illustrative programming examples.

**8. Functions**

Advantages of using functions, structure of a function, declaring and defining functions, return statement, formal and actual arguments, const argument, default arguments, concept of reference variable, call by value, call by reference, library functions, recursion, storage classes. Use of functions through illustrative programming examples.

**9. Arrays and Strings**

Declaration of arrays, initialization of array, accessing elements of array, I/Oof arrays, passing arrays as arguments to a function, multidimensional arrays.String as array of characters, initializing string variables, I / O of strings, string manipulation functions (strlen, strcat, strcpy, strcmp), passing strings to a

function. Use of arrays and strings through illustrative programming examples.

**10. Concepts of Object Oriented Programming**

Introduction to Classes, Objects, Data abstraction, Data encapsulation, inheritance and polymorphis.

**11. Classes and Objects**

Defining classes and declaring objects, public and private keywords, constructors and destructors, defining member functions inside and outside of a class, accessing members of a class, friend function. Use of classes and objects through illustrative programming examples.

**12. Basics of File Handling**

Opening, reading, and writing of files, error handling during files operation.

**ASSIGNMENTS**

**ASSIGNMENT 1**

**Introduction to Computers, Working Knowledge of Computer and Problem Solving and Planning** Q 1.) Draw and explain the Block diagram of Computer System?Q 2.) Explain RAM, Rom and CACHE Memory?Q 3.) What is Application Software and System Software? Explain with example.Q 4.) Write down the steps for Mail Merge?Q 5.) Draw the flowchart to compute the average of five numbers?

**ASSIGNMENT 2**

**Overview of C++, Operators and Expressions and Beginning with C++**

Q 1.)Explain Arithmatic and Relational operators?

Q 2.)Difference between C and C++?

Q 3.)W.A.P to print “Hello World” in C++?

Q 4.) Explain various Header files in C++?

Q 5.) Explain various data types in C++?

**ASSIGNMENT 3**

**Control Structures and Functions**

Q 1.)Write a program to find greatest number among two numbers using if else statement?

Q 2.) Write a program to find weather a number is even or odd?

Q 3.) Difference between while and do while loop? Also give one example?

Q 4.) Explain call by value and call by reference with example?

Q 5.) Write a program to print the prime numbers from 1 to 100?

**ASSIGNMENT 4**

**Arrays, Strings and OOPS concepts**

Q 1.) W.A.P to find the average of N numbers in one dimensional array?

Q 2.)W.A.P of bubble sort?

Q 3.)W.A.P to concatenate strings?

Q 4.) Explain Data Encapsulation and Data Hiding?

Q 5.) Explain Inheritance and its types?

**ASSIGNMENT 5**

**Classes, Objects and File handling**

Q 1.) What is Constructor? Explain with example?

Q 2.) Define Friend Function with example?

Q 3.) Explain ofstream and ifstream with example?

Q 4.) Write a program to show the relationship of class.

**SYLLABUS**

**Environmental Science**

**Part A**

1. Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.2. Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources. 3. Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity 4. Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster Management : Floods, earthquake, cyclone and landslides.

**PART B**

5. Social Issues and the Environment From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland reclamation.Consumerism and waste products.Environment Protection Act.Air (Preventionand Control of Pollution) Act. Water (Prevention and control of pollution) Act.Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness 6. Human Population and the Environment, Population growth, variation among nations.Population explosion – Family Welfare Programme.Environment and human health, Human Rights, Value Education, HIV/AIDS.Women and child Welfare.Role of Information Technology in Environment and human health. Case studies

**ASSIGNMENTS**

**ASSIGNMENT 1**

1. Explain the importance of value education, awareness and community participation in environment protection activities in India.2. Discuss the following with your comments also:

(a) Chipko movement

(b) Narmada BachaoAndolan

3. Discuss the importance of multi-disciplinary nature of environmental studies.

4. What are the problems associated with construction of large dams?

5. What are the major causes and consequences of deforestation? Discuss.

6. How can an individual play a role in conserving the natural resources?

**ASSIGNMENT 2**

1. Explain with neat sketch about the energy and nutrients flow through an ecosystem.

2. What is ecological succession? Describe the causes of ecological succession.

3. What are ecological pyramids? What are various types of ecological pyramids?

4. What are food chains and food webs?

5. Define producers, consumers and decomposers. Quote their role alongwith their examples.

**ASSIGNMENT 3**

1. Discuss case study on TajMahal.

2. How does soil pollution differ from water pollution in effects and control?

3. Discuss the various causes, effects and control measurements of Urban and Industrial waste.

4. What are the harmful effects of air pollutants? How can we prevent and control air pollution?

5. Give a brief account of the Gujarat earthquake of 2011.

**ASSIGNMENT 4**

1. What is acid rain? What are the adverse effects of acid rain?

2. State chief characteristic features of forest conservation act.

3. Explain the phenomenon of Global warming? What are its major causes?

4. What is Ozone hole? How does it form?

5. What is meant by wasteland reclamation? Discuss the possible methodology.

**ASSIGNMENT 5**

1. Describe the problems faced by a child working as a bonded labourer in one of the hazardous industries.

2. How is information technology related to the cause of better human health?

3. Write short notes on:

(a) Human rights

(b) Population explosion

(c) Value education

(d) Women and child welfare

(e) Environmental ethics

**Engineering Chemistry Laboratory**

**1. Analysis of Effluents**

1. Determination of water by EDTA method.
2. Determination of H2O by dissolved oxygen analyzer.
3. Determination of turbidity by Nephelometer
4. Determination of Residual Chlorine.

**2. Analysis of Fuels and Lubricants**

1. Determination of Moisture, Volatile and ash content by proximate analysis.
2. Determination of Flash & Fire point by Abee‟s Apparatus
3. Determination of the viscosity.
4. Determination of Acid Value and Aniline point of oil
5. Determination of refractive index for oils.

**3. Instrumental Analysis**

1. Determination λ-max by spectrophotometer and determination of unknown conc ofbinary mixture of two liquids.
2. Determination of the surface tension by stalagmometer.
3. Determination of the concentration of a solution conductometerically.
4. Determination of the strength of a solution pH meterically.
5. Distinction between acid, ester, ketone using IR spectrophotometer.
6. Determination of bathochromic shifts, hypsochromic and hyperchromic,hypochromic shift of benzene and its derivatives

**4. Chromatography**

1. Determination of Rf value of amino acid by TLC and identification of the aminoacid present.
2. Separation of metallic ions by paper chromatography.
3. Separation of Ions by using complexing agents
4. Separation of plant pigments, Chlorophyll and carotenoids by columnchromatography.
5. Determination of the ion exchange capacity of the given ion exchanger.
6. Separation of ions by ion-exchange method.

**5. Synthesis & Green Chemistry experiments**

1. Preparation of a polymer phenol/urea formaldehyde resin orhexamethylenediamineadipic acid polymer and determination of carbonyl value oracid value.
2. Preparation of aspirin.
3. Preparation of ethyl-2-cyano-3-(4‟-methoxyphenyl)-propeonate (Microwaveassisted reaction)
4. Base catalyzed aldol condensation by Green Methodology

**Engineering Drawing**

**PART A**

**1. Introduction**

Engineering Drawing/Engineering Graphics/Technical Drawing – a Visual Science.Types of Engineering Drawing, Introduction to drawing equipment and use of instruments. Symbols and conventions in drawing Practice. Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to Dimensioning, Concepts of scale in drawing, Types of scales. Basic Definition of geometrical objects: Points, lines, planes and solids.

**2. Theory of Projections**

Relevance of projection, Type of projections, Perspective, Orthographic, Axonometric and their basic principles, System of orthographic projection: in reference to quadrants and octants, illustration through simple problems of projection.

**3. Projection of Points**

Projection of points in quadrants and octants.Projection of point on Auxiliary planes.

**4. Projection of Lines**

Parallel to both H P and V P, Parallel to one and inclined to other, and inclined to both, contained in profile plane. True length and angle orientation of straight line: rotation method and auxiliary plane method. Distance between two nonintersecting lines, and trace of line.

**5. Projection of Planes**

Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, and Lamina oblique to three reference planes. Application of auxiliary planes, and trace of planes.

**6. Projection of Solids**

Definition of solids, types of solids, and elements of solids. Projection of solids in first or third quadrant, with axis parallel to one and perpendicular to other, axis parallel to one inclined to other, axis inclined to both the principle plane, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Use rotation and auxiliary plane method to draw the projections.

**PART B**

**7. Section of Solids**

Definition of Sectioning and its purpose.Procedure of Sectioning, Types of sectional planes.Illustration through examples.

**8. Intersection of Surfaces/Solids**

Purpose of intersection of surfaces, Intersection between the two cylinder, two prisms, prism and pyramid, pyramid and pyramid, cylinder and prism, cone and cylinder, sphere and cylinder etc., use of cutting plane and line method.

**9. Development of Surface**

Purpose of development, Parallel line, radial line and triangulation method.Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, and development of surface of sphere.

**10. Isometric Projection**

Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing.Isometric projection of solids such as cube, prism, pyramid and cylinder, and assignments on isometric projection of simple machine parts.

**11. Orthographic Projection**

Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts.

**BTCS102Fundamentals of Computer Programming and IT**

**1. Familiarization with the Computer System:**

* To explain the part of the computer system such as system unit, input devices, output

devices connected to the computer.

* To explore the outside view of the system unit that includes the panels on front and

ports at the rear

* To explore the inside view of the system unit that includes the motherboard,processor,

expansion slots, various add-on cards, storage devices, power supply, fans.

* To understand the booting process that includes switching on the system, execution of

 POST routine, then bootstrap loader, and loading of the operating system, and getting

it ready for use.

* To introduce the graphical user interface (desktop) of Windows operating system

to explain the various elements of the desktop such as taskbar, icons (My Computer,

Recycle Bin, etc.), short cuts, notification area.to configure the desktop that include

selecting the wall paper, selecting the screen saver with or without password protection, selecting

the screen resolution and color quality.

**2. Navigating with Window Explorer:**

* To navigate with the drives
* To create new folders
* To move folders from one drive to another drive
* To move files from one folder to another folder
* To search files and folders
* To share files and folders
* To view and/or change the attributes of the files and folders

**3. Working with Control Panel:**

* To work with date and time
* To create new user accounts
* To install new hardware and configuring existing hardware
* To install new software or remove existing installed software
* To configure network connections
* To manage security profile

**4. Miscellaneous Features:**

* To work at the command prompt
* To open an application, folder, document or internet resource from the Run command
* To initialize storage media (formatting)
* To understand the menace of viruses
* To understand the working of virus guards and antivirus software

**5. Exploring the Internet:**

* To understand the working of the internet that include the use of protocols, domains,
* IP addresses, URLs, web browsers, web servers, mail-servers, etc.
* To create email-account, sending mails, receiving mails, sending files as attachments,

etc.

* To login to a remote computer
* To search information using search engines

**6. Microsoft Word:**

* To familiarize with parts of Word window
* To create and save a document
* To set page settings, create headers and footers
* To edit a document and resave it
* To use copy, cut and paste features
* To use various formatting features such as bold face, italicize, underline,subscript,

superscript, line spacing, etc.

* To use spelling and grammar checking feature
* To preview print a document

**7. Microsoft Word continued:**

* To create a table with specified rows and columns
* To enter data in a table
* To select a table, a row, a column or a cell
* To inset new row and/or a column
* To delete a row and/or a column
* To split and merge a row, column or a cell
* To understand the mail-merge and to use mail merge feature of MS-Word

**8. Microsoft Excel:**

* To familiarize with parts of Excel window
* To create and save a workbook with single and/or multiple worksheets
* To edit and format text as well numbers
* To apply operations on range of cells using built-in formulae
* To preview and print a worksheet

**9. Microsoft Excel continued:**

* To insert new row and/or column in a worksheet
* To delete a row and/or column in a worksheet
* To create a variety of charts
* To import and export data to or from worksheet

**10. Microsoft PowerPoint:**

* To familiarize with parts of PowerPoint window
* To create and save a new presentation
* To apply design templates to a presentation
* To insert, edit and delete a slide
* To use different views of slides
* To use slide show from beginning or from the current slide
* To preview and print a presentation

**11. Microsoft PowerPoint continued:**

* To check spellings in a presentation
* To add clip art and pictures in a slide
* To add chart, diagram and table in a slide
* To set animation for a selected slide and/or for entire presentation
* To create slide master and title master
* To create a custom show

**12.** Write a program to find the nature of the roots as well as value of the roots.

 However, in case of imaginary roots, find the real part and imaginary part separately.

**13.** Write a program, which takes two integer operands and one operator form user,

performs the operation and then prints the result. (Consider the operators +,-,\*, /, %

and use *switch* statement).For example, the input should be in the form: 5 + 3 the

output should comes Result = 8

**14.** Fibonacci sequence is defined as follows: the first and second terms in the

sequence are 0 and 1. Subsequent terms are found by adding the preceding two

terms in the sequence. Write a program to generate the first *n* terms of the

sequence. For example, for *n* = 8, the output should be 0 1 1 2 3 5 8 13

**15.** Write a program to print all the prime numbers between *m* and *n*, where the

value of *m* and *n* is supplied by the user.

**16.** The number such as 1991, is a palindrome because it is same number when read

forward or backward. Write a program to check whether the given number is

palindrome or not.

**17.** A positive integer number IJK is said to be *well-ordered* if I<J<K. For example,

number 138 is called *well-ordered* because the digits in the number (1, 3, 8)

increase from left to right, *i.e.*, 1 < 3 < 8. Number 365 is not *well-ordered*because 6

is larger than 5. Write a program that will find and display all possible three digit

*well-ordered*numbers. The program should also display the total number of three

digit*well-ordered* numbers found.

**18.** Write a function to computer the highest common factor of integer numbers *m* and

*n*. Use this function to find the highest common factor of integer numbers *a* and*b*.

**19.** Given the marks (out of 100) obtained by each student in a test of a class with *n*

students. Write a program to obtain the following information:

(*a*) minimum and maximum marks score

(*b*) average score of the class, and

(*c*) number of students whose score is greater than class's average score

**20.** Write a program to multiply matrix A*m*×*n*by B*p*×*q,* given that *n* = *p*.

**21.** Write a program to sort a list of *n* integer numbers in descending order using

bubble sort method.

**22.** Create a class named *Student* with the appropriate data members and member

functions to generate output comprising student's admission no., name, marks in five

subjects and the %age of marks obtained. Write a program to use the *Student* class.

**23.** Create a class named *ComplexNumber*with the appropriate data members and

constructors. Include member functions (defined inside the class) to perform the

following operations:

(*a*) Inputting a complex number

(*b*) Outputting a complex number

(*c*) Arithmetic operations on two complex numbers

 Write an appropriate program to demonstrate use of the *ComplexNumber*class.

**24.** Create a class named *Height* with *feet* and *inches* as its data members. Also

include appropriate constructors (and destructor, if required). Include member

functions (defined outside the class) to perform the following operations:

(*a*) Inputting a height of a person

(*b*) Displaying a height of a person

(*c*) To get height in inches

(*d*) To compare two heights

 Write an appropriate program to demonstrate use of the *Height* class

**BTME 103 Engineering Computer Graphics Laboratory**

**Lab Work I:** Involves hands-on practice sessions related to 2-D computer sketching.

**Exercise 1**: Study and draw 2-D sketching entities like lines, rectangle, parallelogram

polygon, circle etc., under SKETCH ENTITY MENU.

**Exercise 2:** (a) Rectangular array (b) Circular array

**Exercise 3:** Sketch of Metal grate

**Exercise 4:** Slotted Base

**Exercise 5:** Link

**Exercise 6:** Base Plate (Extruding the sketch)

**Exercise 7:** Bush (Revolve)

**Exercise 8:** Handle (Revolve)

**Exercise 9:** Flange coupling parts

**Exercise 10:** Bell Crank Lever

**Lab Work-II:** Using the geometric shape and size data learnt in Lab Work I, extrude or

revolve the sketch to obtain 3-D drawing. Study and practice various

options available for 3-D drawing.

**Exercise-1:** Bracket Lever

**Exercise 2:** Hand Wheel

**Exercise 3:** Hexagonal Nut and Bolt

**Exercise 4:** Keys

**Exercise 5:** Body of Solid Journal Bearing

**Exercise 6:** Shaft

**Exercise 7:** Cup of Screw Jack

**Exercise 8:** Screw Jack Body

**Exercise 9:** V-Block

**Exercise 10:** Gland