



## 20BS03 Multivariate Calculus

### Teaching Scheme:

Lectures: 3 Hrs/Week

Tutorial: 1 Hr/Week

Number of Credits: 4

### Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

### Course Objectives:

1. To familiarize the students with techniques of differentiation and integration of multivariable function.
2. To equip the students to deal with advanced level of Mathematics, and applications that would be essential for their disciplines.

### Course Outcomes:

After completion of this course, students will be able to

**CO1:** Calculate partial derivatives and solve problems using partial derivatives.

**CO2:** Analyze stationary points and calculate extrema of function of several variables.

**CO3:** Solve double integral, triple integral over the region.

**CO4:** Determine physical parameters using double and triple integral.

### Course Content:

#### Unit – I: Partial differentiation (09)

Function of several variables, partial derivatives, Geometrical interpretation of partial derivatives, chain rule, higher order partial derivatives, Euler's theorem.

#### Unit – II: Applications of partial differentiation. (07)

Maxima, minima and saddle points, second derivative test, constrained extrema and Lagrange's multipliers, applications in optimization of functions of several variables. Applications of first order partial derivatives in data fitting using the method of least squares.

#### Unit – III: Double integration (10)

Tracing of curves in Cartesian and Polar coordinate system, double integrals over a rectangle, double integrals over regions, change of order of integration, Introduction of Jacobian determinant for two variables, double integral in polar coordinates, The Gaussian integral.

**Unit – IV: Triple integration** (09)

Triple integral over a box, triple integrals by iterated integration, change of variables, Cylindrical and Spherical coordinates, The Jacobian determinant for three variables, evaluation of triple integral.

**Unit – V: Applications of Double and Triple integration** (07)

Applications of double integral and triple integral: Area of plane Lamina, mass of plane lamina, surface area, volume, mass of solid.

**Text Books:**

1. B. V. Ramana, '**Higher Engineering Mathematics**', *Tata McGraw Hill Publications*, (2007).
2. B.S. Grewal, '**Higher engineering Mathematics**', *Khanna publishers*, (40<sup>th</sup> edition), (2008).
3. Hughes-Hallett et al., '**Calculus - Single and Multivariable**', *John-Wiley and Sons*, (3<sup>rd</sup> Edition), (2003).
4. Maurice Weir, Joel Hass, '**Thomas' Calculus**', *Pearson India*, (13<sup>th</sup> edition), (2016).

**Reference Books:**

1. J. E. Marsden, A. J. Tromba and A. Weinstein, '**Basic Multivariable Calculus**', *Springer*, (3<sup>rd</sup> edition), (1993).
2. G. B. Thomas and R. L. Finney, '**Calculus and Analytic geometry**', *Pearson*, *Reprint* (9<sup>th</sup> Edition), (2002).
3. Sudhir Ghorpade, Balmohan Limaye, '**A Course in Multivariable Calculus and Analysis**', (Undergraduate Text in Mathematics), *Springer* (2009).
4. Dennis G. Zill, Warren S. Wright, '**Multivariable Calculus, Early Transcendental**', *Jones & Bartlett Publisher* ( 4<sup>th</sup> edition), (2009).

## 20BS02 Chemistry

### Teaching Scheme

Lectures: 3Hrs/week

Credits: 3

### Examination Scheme

In-Semester: **50** Marks

End-Semester: **50** Marks

### Course Objectives

The Chemistry course is designed such that the learners imbibe chemical principles relevant in the engineering context. The course facilitates undergraduates to understand chemical processes, methods of analysis, structure-property relationship and evaluate role of chemical substances for engineering applications. Further the course inculcates basic problem-solving skills involving chemistry principles.

### Course Outcomes

The students will be able to –

**CO1:** Interpret properties and applications of molecules based on their atomic structure.

**CO2:** Analyze quality parameters for water, coal, petrol using analytical methods.

**CO3:** Solve given problems by applying chemical/electrochemical principles.

**CO4:** Outline the process of synthesis for inorganic substances and nanomaterials.

**CO5:** Rationalize the working principle of a pHmeter, conductometer, flame/spectrophotometer, electrochemical cell or a given reagent for its function.

### Module 1: Physical Chemistry

(13)

**Unit 1-** Chemical Bonding: Types of bonds, intermolecular forces, bonding in molecules: valence bond theory, molecular orbital theory for diatomic molecules.

**Unit 2-** Electrochemistry: Electrochemical cell, Nernst equation, EMF of cell, reference and indicator electrodes, battery characteristics, Lead-acid, Lithium-ion battery, Fuel cell technology.

## **Module 2: Inorganic and Materials Chemistry**

**(13)**

**Unit 3** - The Periodic table and properties; Chemistry of some elements like H, Si, extraction of Si to making a chip, H<sub>2</sub> gas as fuel.

**Unit 4** - (A) Engineering materials: Structural features, properties and applications of OLEDs - PPV (- solar cell), liquid crystal polymers, conducting polymers – as a chemical sensor, polymer composites.

(B) Nanomaterials: Introduction to nanomaterials, synthesis by top down and bottom-up methods. Structure, synthesis and some typical applications of nanomaterials.

## **Module 3: Analytical Chemistry**

**(16)**

**Unit 5** - Analysis of -

(A) Water: hardness in water, TDS, effect of hard water in boilers, water softening techniques-zeolite and ion exchange method. Reverse osmosis. Waste water recycling.

(B) Carbon based fuels: Analysis of coal and petrol.

**Unit 6** - Analytical techniques such as pH-metry, conductometry, spectroscopy and their applications.

### **Text Books:**

1. S.S. Dara 'Engineering Chemistry' S. Chand Publications (2010)
2. B.S. Chauhan 'Engineering Chemistry': Univ Sc Press. (Third edition)2009
3. Shashi Chawla 'A Text Book of Engineering Chemistry': Dhanpat Rai & Co. (2015)
4. Jain and Jain 'A Text Book of Engineering Chemistry' Dhanpat Rai & Co.
5. G.Chatwal 'Instrumental methods of Chemical Analysis' Himalaya publication house

### **Reference Books:**

1. Steven S. Zumdahl, 'Chemistry concepts and applications', Cengage learning publication (2009)
2. Ram D. Gupta, 'Hydrogen fuel' C.R.C. Publications (2009)
3. Puri, Sharma, Pathania 'Principles of Physical Chemistry': Vishal Publ. Co.
4. Robert Braun 'Instrumental methods of analysis' Pharma med press (2010)
5. J.D. Lee, 'Concise Inorganic Chemistry', 4<sup>th</sup> edition, Wiley Publication (2019)

## 20ES01 Basic Electrical and Electronics Engineering

### Teaching Scheme:

Lectures: 3 Hrs./Week

Credits: 3

### Examination Scheme

In-Semester: **50** Marks

End-Semester: **50** Marks

### Course Objectives:

1. To educate the students about the realization of basic theoretical concepts & laws in electrical engineering in real physical world.
2. To make students familiar with three phase supply.
3. To make students familiar with single phase transformers.
4. To understand the construction and applications of diode and BJT
5. To understand basics of combinational logic, Boolean algebra and flip -flops.

### Course Outcomes:

After completion of course, students will be able to

**CO1:** Analyze and calculate parameters of DC circuits

**CO2:** Analyze and calculate parameters of AC circuits

**CO3:** Calculate performance parameters of single-phase transformer.

**CO4:** Analyze I-V characteristics of semiconductor diodes and transistors and design simple analog circuits using these devices

**CO5:** Build simple combinational and sequential logic circuits.

### Unit – I: DC Networks

(08)

Kirchhoff's laws, Mesh and Nodal Analysis, Thevenin and Superposition Theorems, maximum power transfer theorem, Network Simplifications using star-delta / delta-star transformations.

### Unit – II: AC Circuits

(07)

Series and parallel RL, RC and RLC circuits , concept of Impedance and admittance, power triangle and power factor. Resonance in series and parallel RLC circuit, Three phase voltage generation and waveform, star and delta balanced systems. Relationship between phase and line quantities, phasor diagram, power in a three phase circuit.

**Unit – III: Electromagnetism and Single Phase Transformers (06)**

Magnetic materials and B-H curve, self and mutual inductance,  $1 \Phi$  transformer: concept, types, working, ideal transformer, practical transformer, equivalent circuit, phasor diagram, efficiency and regulation calculations.

**Unit – IV: Diodes and rectifiers (07)**

Construction and characteristic of p-n junction diode, LED, photodiode, Half wave, full wave and bridge rectifiers, need of capacitor filter, rectifier operation with capacitor filter, Zener diode as a voltage regulator, block diagram of Regulated power supply

**Unit – V: Junction Transistor Amplifiers (07)**

Bipolar junction transistor, Construction of BJT, Types of biasing:-fixed bias and self bias circuit, BJT characteristics for-CE,CB,CC configurations, relationship between  $\alpha$  and  $\beta$ , load line for a transistor, application of transistor as a switch and amplifier.

**Unit – VI: Digital Electronics (07)**

Basic gates, implementation of basic gates using universal gates, Boolean algebra, standard representation of logic functions (SOP and POS forms), Introduction of Combinational logic circuits like multiplexer ,demultiplexer, half adder and full adder, Introduction of Sequential logic circuits like flip- flops (SR, D), counters and shift registers.

**Text Books:**

1. Hughes, 'Electrical and Electronic Technology', Pearson education, (10th edition), (2008)

**Reference Books:**

1. D.P. Kothari and I.J. Nagrath, 'Basic Electrical Engineering', McGraw-Hill, (3rd edition), (2010)
2. A.E.Fitzgerald, A.Grabiell,'Basic Electrical engineering',McGraw-Hill, (5th edition), (2009)
3. Floyd, 'Electronic Devices and Circuits', pearson education, (7th edition),(2008)
4. AP Malvino & Donald Leach,'Digital Principles and Applications', McGraw Hill Education,( 6 th edition), (2009)

## 20ES05 Fundamentals of Programming Language-2

### Teaching Scheme:

Lecture: 3 Hr/week

Credits: 3

### Examination Scheme:

In-Semester: **50** Marks

End-Semester: **50** Marks

### Course Objectives:

To facilitate the learners:

- 1) To understand and apply object-oriented principles for application development.
- 2) To develop programming applications using Java.
- 3) To make use of class, object, constructor.
- 4) Learn programming construct of Java.

### Course Outcome:

By taking this course, the learner will be able to:

**CO1:** Demonstrate and Make use of object-oriented principles for effective programming.

**CO2:** Construct readable and maintainable code using polymorphism.

**CO3:** Apply object oriented concepts of class, object creation and constructor for program development.

**CO4:** Apply principles of code-refactoring and efficient code reuse for problem solving.

### Unit-I : Introduction to Object Oriented Programming Paradigm (6)

Role and need of programming languages, characteristics of a good programming language, introduction to various programming paradigms. Need of object-oriented paradigm, basic concepts of object oriented programming (OOP), benefits of OOP. General characteristics for OOP, Object oriented concepts: Class, Object, abstraction, encapsulation, polymorphism, and inheritance. Illustration through real life examples and use cases

### Unit-II : Introduction to Java Programming Language (8)

History of Java, Features of Java, Java and Internet, Java virtual machine, First java Program, Command line arguments, Java Programming elements: Data types, Control Structures, Encapsulation, Abstraction and Polymorphism, Class, object, constructor  
Illustration through real life examples and use cases

### Unit-III : Polymorphism (6)

This keyword, static method, function overloading, argument passing, constructor overloading.  
String and Array's in Java, Java Collection Framework – ArrayList, HashSet  
Illustration through real life examples and use cases

**Unit-IV: Inheritance (8)**

Types of inheritance, base class and derived class, access specifiers, method overriding.  
Illustration through real life examples and use cases

**Unit-V: Abstract Class, Interfaces and Packages (8)**

Abstract class, interfaces, run time polymorphism. Creating and importing packages.  
Illustration through real life examples and use cases

**Unit-VI: Exception Handling in Java (6)**

Errors and Exceptions, Types of exceptions, try, catch, throw, throws and finally keywords,  
Build-in exceptions, creating and using custom exceptions.  
Illustration through real life examples and use cases

**Text Books:**

1. Herbert Schildt, "JAVA Complete Reference", Tata McGraw Hill, (9<sup>th</sup>Edition), (2014)
2. Eckel B., "Thinking in Java", Pearson Education, (3<sup>rd</sup> Edition)
- 3.

**Reference Books:**

1. Kathy Sierra & Bert Bates, "Head First Java", Oreilly publication,(2<sup>nd</sup> Edition) (2009)
2. Barry Burd "Beginning Programming with Java for Dummies", Oreilly publication, (5<sup>th</sup> Edition) (2017)
3. Paul Deital and Harvey Deital,"Java How to program", Prentice Hall Publication,(9<sup>th</sup> Edition) (2011)





## 20ES05M Engineering Mechanics

### Teaching Scheme:

Lectures: 2 Hrs/Week

Tutorial: 1 Hrs/Week

Credits: 3

### Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

### Course Objectives:

1. To familiarize the concepts of equilibrium and friction.
2. To study and analyze the motion of moving particles and bodies.

### Course Outcomes:

After completion of this course, students will be able to

**CO1:** Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.

**CO2:** Co-relate real life applications to specific type of friction and estimate required force to overcome friction.

**CO3:** Establish relation between velocity and acceleration of a particle and analyze the motion by plotting the relation.

**CO4:** Analyze particles in motion using force and acceleration, work-energy and impulse-momentum principle.

### Course Contents:

#### Unit – I: Rigid body: Statics (06)

Equivalent force systems, Equations of equilibrium, free body diagram, reactions. Static, intermediately and partial constraints, Two and three force systems.

Structures: 2D truss, method of joints, method of selection. Frame, beams, types of loading and supports. Shear force and bending moment diagrams.

#### Unit – II: Friction (03)

Dry friction (static and kinetic) wedge friction, disk friction, belt friction, journal bearings, wheel friction and rolling resistance.

**Unit – III: Center of Gravity and Moment of Inertia (04)**

First and second moment of inertia and mass. Radius of gyration, parallel axis theorem, product of inertia, rotation of axes and principal M.I. by direct method. Composite bodies.

**Unit – IV: Kinematics of Particles (04)**

Rectilinear motion, curvilinear motion, rectangular, normal-tangential, polar, cylindrical co-ordinates, relative and constrained motion, space curvilinear motion.

**Unit – V: Dynamics of Particles (03)**

Force, mass and acceleration, work-energy, impulse-momentum principle, impact of bodies.

**Unit – VI : Kinetics of Rigid Bodies (04)**

Translation, fixed axis rotation, general planner motion, work-energy, power, potential energy, impulse-momentum and associated conservation principle, Euler equation of motion and its applications.

**Text Books :**

1. R. C. Hibbeler, 'Engineering Mechanics (statics and Dynamics), 12<sup>th</sup> Edition, *Pearson publication.*

**Reference Books:**

1. Timoshenko and Young, 'Engineering Mechanics', *Tata Mc-Graw Hill*, New Delhi.
2. Mclean, and Nelson, 'Theory and problems of Engineering Mechanics (Statics and Dynamics)', *Schaum Series.*
3. Beer and Johnson, 'Vector Mechanics for Engineers-Dynamics' *McGraw Hill Education.*
4. 'Engineering Mechanics (Statics and Dynamics)', Dorling Kindersley (India) Pvt. Ltd. *Pearson Education.*
5. Dr.R.K.Bansal , Sanjay Bansal, 'A Text book of Engineering Mechanics', *Lakshmi publications.*

## 20ES06 Geo-Informatics

### Teaching Scheme:

Lectures: 3Hrs. /Week

Credits: 3

### Examination Scheme:

In-Semester: **50** Marks

End-Semester: **50** Marks

### Course Objectives:

1. To introduce the science and technologies involved in Remote sensing.
2. To understand the application of GIS in various fields
3. To explain the earth and mapping principles.
4. To learn basics about the Geodata & GIS software.

### Course Outcomes:

A student should be able to:

**CO1:** Demonstrate fundamentals of remote sensing

**CO2:** Interpret data from satellite images and their characteristics.

**CO3:** Compare and understand an image visually and digitally with digital image processing techniques.

**CO4:** Explain the concepts and fundamentals of GIS.

**CO5:** Distinguish between types of GPS and their working principles

**CO6:** Apply knowledge of remote sensing and GIS in different engineering applications.

### Course Content:

#### Unit – I: Principles of remote sensing

(07)

Concept of Remote Sensing, Working Principle, Types of remote sensing, Platforms of remote sensing, Output of remote sensing – photography, satellite imagery and visual interpretation data

#### Unit – II: Data interpretation method in remote sensing

(06)

Types of data, Visual interpretation of images-Natural and false colour composites, Image resolution, Limitations, Applications

**Unit – III: Photogrammetry & Cartography (08)**

- A) Fundamentals of aerial photography, satellite images, virtual images, Image processing, Digitalization of maps.
- B) Cartography:- Conventional Maps, Definition, Map Basics Elements/components of map, Map Scale, Large & Small Scale maps, Thematic maps , Coordinate system , Polar & Cartesian (Latitude-Longitude & x,y coordinates)

**Unit – IV: Geographical information system (GIS) & Database management for Geoinformatics (08)**

- A) GIS :- Concept & definition of GIS (based on components, based on functions), GIS vs. Conventional Mapping, Components of GIS, Working Principle of GIS, - Strengths of GIS, - Geoinformatics Vs. GIS
- B) Database management for geoinformatics, GIS Data and Data Models, Concept of Query, Concept of Spatial Analysis.

**Unit – V: Global positioning system (GPS) (06)**

History of GPS, Types of GPS, Working principle, Applications of GPS, case study.

**Unit – VI: - Application of geoinformatics (07)**

Case studies to be used for demonstration-

1. Navigational services – available on phones (travel direction from A to B)
2. Vehicle tracking system / Fleet management – Cabs, City buses, Trains, Aircrafts
3. City Planning (urban sprawl, master planning)
4. Solid waste management (identifying location for waste disposal site, route optimization of waste collection, online/offline monitoring of waste collection)
5. Identifying suitable location for business outlet (Pizza hut, Teco bell, General Motors)
6. GIS for location based services (courier & other home delivery services) – Fedex, DHL

7. Telecom sector uses GIS (planning of OFC network, identifying suitable location for mobile towers, marketing, operations)
8. Disaster Management using GIS (modelling & simulation tools – through videos)

**Text Books:**

1. LO. C.P., and Albert K.W. Yeung-**Concepts and Techniques of Geographic Information Systems**, *Prentice-Hall of India, New Delhi, 2006.*
2. Ian Heywood, Sarah Cornelius and Steve Carver -**An Introduction to Geographical Information Systems**-(4th Edition) by 2012
3. A.M. Chandra, S.K. Ghosh, - “**Remote Sensing and Geographical Information System**”, 1st Edition, *Narosa Publishing house, 2007.*

**Reference Books:**

1. Peter A. Burrough and Rachael A. Mc. Donnell- **Principles of Geographical Information System**, *Oxford University Press Inc., New York, 2004.*
2. Ian Heywood, Sarah Cornelivs and Steve Carver, **An Introduction to Geographical Information System**, *Pearson Education Pvt .Ltd., New Delhi, 2007.*
3. Arthur H. Robinson et al.**Elements of Cartography**, V Edition, *John Wiley & Sons, New Delhi, 2002.*
4. Misra, R.P.and Ramesh, A, **Fundamentals of Cartographyconcept**-*Publishing Company, New Delhi, 2002.*
5. Lillesand M. Thomas and Ralph W.Kiefer- **Remote Sensing and Image Interpretation.**

## 20BS02L: Chemistry Laboratory

### Teaching Scheme:

2 hours per week

Credits: 1

### Examination Scheme:

Term Work: 25 Marks

### Course Objectives:

The objective of the Chemistry Lab course is

1. To develop experimental skills.
2. To correlate the properties of a substance based on experimental observations.
3. To demonstrate use of analytical techniques for analysing substance for its properties or quality.

### Course Outcomes:

By taking this course, the students will be able to —

**CO1:** Identify analytical technique required for performing chemistry experiment.

**CO2:** Prepare and analyse substances based on certain parameters and evaluate their quality (zeolite/ coal/water/ polymer)

**CO3:** Measure observables for a chemical change in the experiment and draw inferences.

**CO4:** Justify the significance of a selected technique/ specific role of a reagent in a given chemical experiment

### List of Experiments: (Any 8)

1. To determine Total hardness of water by EDTA Method (complexometric titration).
2. To determine alkalinity of given water sample.
3. Preparation of sodium zeolite and use it for water softening.
4. Estimation of sodium from soft water using flame photometry.
5. To determine concentration and strength of acid from given solution by pH metric titration.

6. To determine concentration of acetic acid in vinegar by potentiometric titration.
7. Conductometric titration to determine concentration of strong acid /base.
8. To determine Molecular weight of a Polymer by viscometric method.
9. Colorimetric estimation of  $\text{KMnO}_4$ .
10. Proximate Analysis of coal.
11. Preparation of biodiesel and its characterization.

## 20ES01L Basic Electrical and Electronics Engineering Lab

### Teaching Scheme:

Practical: 2 Hrs./Week

Credits: 1

### Examination Scheme:

Term Work: 25 marks

### Course Outcomes:

After completion of course, students will be able to

- Perform basic domestic wiring
- Apply circuit laws to find the parameters of given electrical network
- Build a basic regulated DC power supply
- Obtain frequency response of CE amplifier
- Build basic digital circuits

### List of experiments:

- Introduction of different electrical and electronics components and instruments.
- To perform electrical wiring to control lamps using one way and two-way switches.
- To verify Thevenin's theorem & superposition theorem.
- To determine phase angle of L-C-R series circuit.
- To perform load test on single phase transformer to determine regulation and efficiency.
- To determine output voltage and ripple voltage of half wave, full wave rectifier with center tap transformer and bridge rectifier with and without filter.
- Assemble and build simple DC regulated power supply.
- To determine frequency response of CE amplifier.
- Assemble and build half adder & full adder circuits.



## 20ES05L Fundamentals of Programming Language Lab-2

### Teaching Scheme:

Practical: 2 Hr/week

Credits: 1

### Examination Scheme:

In-Sem: 25 Marks

### Course Objectives:

To facilitate the learners:

- 1) To explore the principles of object oriented programming
- 2) To apply object oriented programming concept for developing applications using Java
- 3) To make use of class, object and constructor for coding basic object oriented program
- 4) To handle built-in and user defined exceptions

### Course Outcome:

By taking this course, the learner will be able to:

- 1) Develop basic object oriented program using class, object and constructor
- 2) Develop readable and reusable code using inheritance and polymorphism
- 3) Make use of exceptions using inbuilt classes and user defined exceptions
- 4) Develop application using object oriented programming language Java to solve given problem

A large part of ESFL205 lab would be for understanding the basic concepts of object-oriented programming and implementation of some real-world simple applications. Assignment statements are in brief and should be implemented in JAVA programming language. Faculty members are encouraged to expand problem statements with variations. Assignments can be framed and expanded in such a way that it explores concepts, language constructs, logic of solution and simple application. Students will be encouraged to solve open problems in different domains. Faculty will appropriately adopt assignments on similar lines as the examples shown here.

### Example List of assignments:-

#### Group A: Assignment to write program in OO language to understand concept of data abstraction and encapsulation

1. Write a MyDate class which has attributes as day, month and year. Create five objects of MyDate and display them.
2. Design a user defined abstract data type 'Complex' in Java. Write a program to perform arithmetic operations of two complex numbers.  
A complex number has a real part and an imaginary part.

- a) Given the values of real part and imaginary part of a complex number, the magnitude of the complex number can be calculated as square root of the sum of squares of real part and the imaginary part.
  - b) The argument of the complex number can be calculated as tan inverse of ratio of imaginary part(numerator) and real part(denominator )
  - c) The complex number can be added to another complex number and the answer of the addition is a complex number. When one adds two complex numbers, the real parts of each of the complex numbers is added which becomes a real part of the answer and imaginary part of each complex number is added together which becomes imaginary part of the answer. Both these results are real and imaginary parts for a complex number which is the answer of the addition complex conjugate of the complex number can be calculated by negating the imaginary part of the complex number
  - d) The complex number can be subtracted from another complex number and the answer of the subtraction is a complex number.
  - e) When one subtracts a complex number from the other, the real part one complex number is subtracted from the other and the result becomes a real part of the answer and imaginary part of one complex number is number is subtracted from the other and the result of subtraction becomes imaginary part of the answer. Both these results are real and imaginary parts for a complex number which is the answer of the subtraction.
3. Create a student result database in Java. Calculate the grades of students. Decide criteria for best student and short-list students who satisfy the criteria.
- a) A student has a roll No, name, marks in five courses and a grade. A student list has many students. If a student has grade equal or beyond 8, he is considered as a top band student.
  - b) Create at least ten students. From these, find all such students which satisfy the criteria of top band student. Create a list of such students and display the students in the list.
4. A circle has a radius. Its area can be calculated. The area is a double number. Its perimeter can be calculated as  $2\pi r$  . The perimeter is a double number. Given two circles one can find out which is large and which is small.  
Create two circles c1 and c2 with radius as 10 and 7 respectively. Calculate the area and perimeter of each. Compare two circles with each other and display which is large and which is small.
5. Write a JAVA program to perform String operations using String/String Buffer class

- a) Write a program that reads a word and then prints the first character, the last character, and the characters in the middle. For example, if the input is Cummins, the program prints Cummins.
- b) Write a program that reads a name (such as Ranbeer Rishi Kapoor ) and then prints a monogram consisting of the initial letters of the first, middle, and last name (such as RRK).

**Group B: Assignment to write program in OO language to understand concept of class inheritance and polymorphism.**

1. Implement Java program to calculate area and perimeter of various shapes-circle, triangle and rectangle.
2. Create an application like book shop and maintain the inventory of books that are being sold at the shop
3. Find appropriate class hierarchy, polymorphic behavior in applications like banking and implement it.
4. Model the HRD application using the concepts of inheritance, interface, polymorphism
5. A company has many employees. An employee has employee Id, basic salary, house rent allowance, dearness allowance, profession tax and total salary. An employee has an address. The address has apartment number, apartment name, road and PIN code.

The total salary of an employee is the summation of basic salary, house rent allowance which is 20 percent of basic salary, dearness allowance which is 45 percent of basic salary. The take home salary is calculated after deducting profession tax from which is 7 percent of basic salary from the total salary.

When an employee is appointed, he is assigned with an employee Id and basic salary. One can ask for total salary of the employee and take-home salary of the employee.

Identify a class/classes from the above statement, identify the attributes, the data types, the behaviour. Test your program for ten employees

Display all the details of the employees as per id and as per pin code.

Display take home salary for all the employees, display the tax to be deducted across all employees.

6. Reading material has title and price. A book is a reading material. It has ISBN number. A magazine is a reading material, it has month of issue. A CD is a reading material, it has duration in minutes. Represent the above description as a generalization, specialization tree. Identify the parent class, its attributes, child class and their attributes. Write all of them clearly.

7. A vehicle has engine no and chassis number. It can be locked, unlocked. Every vehicle is movable (interface). It can be started, stopped, turned, accelerated, turned, and decelerated. A car is a vehicle. It has steering. An airplane is a vehicle. It has wings. A boat is a vehicle. It has propeller.

**Group C: Assignment to write program in OO language to understand concept of exception handling**

- 1) Write a program to catch various in-built exceptions (try, catch and finally block)
- 2) Create User defined exception to check the specific conditions for systems like recruitment etc and throw the exception if the criterion does not met in Java.
- 3) Consider student data consist of fields such as roll number, name, and marks of various subjects. Write a program using inbuilt and user defined exceptions to avoid invalid entry.

## 20ES05ML Engineering Mechanics Lab

### Teaching Scheme

Practical: 02 Hrs/week

Credits: 1

### Examination Scheme

In-Semester: 25 marks

**Course Objective:** To demonstrate the basic principles of Engineering Mechanics namely Engineering Statics and Engineering Dynamics.

**Course Outcomes:** At the end of the course the student will be able to

CO1: Verify law of Force Polygon and law of moments.

CO2: Determine mechanical advantage, Velocity ratio and efficiency of a screw jack.

CO3: Evaluate co-efficient of friction between two different materials.

CO4: Determine 'mechanical advantage, velocity ratio and Mechanical efficiency.

**Course Contents:** List of Experiments

1. To verify the law of force polygon.
2. To verify the law of moments using parallel force apparatus. (Simply supported type).
3. To determine the co-efficient of friction between wood and various surface (like leather, wood, aluminum) on an inclined plane.
4. To find the forces in the members of jib crane.
5. To determine the mechanical advantage, velocity ratio and mechanical efficiency of a screw jack.
6. To determine the mechanical advantage, velocity ratio and mechanical efficiency of the wheel and axle.
7. Verification of force transmitted by members of given truss.
8. To verify law of moments using bell crank lever.
9. To find the C.G. and Moment of Inertia of an irregular body experimentally and verify using computational method.

## 20ES06L Geo-Informatics Lab

### Teaching Scheme:

Practical: 2 Hr/Week

Credits: 1

### Examination Scheme:

In-Semester: 25 Marks

### Course Objectives:

1. To learn basics about the Geodata & GIS software.
2. To introduce students basics of spatial data and its creation.

### Course Outcomes:

A student should be able to:

1. Demonstrate the process of data acquisition of satellite images and their characteristics.
2. Apply basic data visualization concepts such as colour theory, symbolization.
3. Explain the components of GIS.
4. Apply knowledge of remote sensing and GIS in various engineering applications.

### Course Content:

#### (A) Remote Sensing Lab

1. Observation of feature details seen in images of different resolutions, 3D visualization of aerial photograph using Stereoscope.
2. Visual Interpretation of multispectral and Panchromatic image

#### (B) GIS Lab

3. Exploring Google Earth
  - Locating a place
  - Layers
  - Display Controls
  - Changing coordinate system
  - Adding place marks (Ground trothing)
  - Saving KMZ/ KML files

4. Open source software of GIS

- Understanding QGIS interface
- Different types of file formats

5. Working with Data

- Adding Vector data/ Raster Data
- Display Controls

6. Point, Line, Polygon feature,

- Feature selection/deselection

7. Layers, Properties of layers, Feature Symbology

8. Querying data -Aspatial and Spatial Query

9. Digitization of map, creating layers

**(C) GPS Lab-** Liner data collection using GPS

**References-** Learning QGIS packt publishing by Anita Gaser