Jharkhand University of Technology, Ranchi

B. Tech. First Year

Revised

Branch: EE, EEE, ECE, CSE, IT, Cybersecurity,

Data Science

Semester: I

Session: 2023-2024

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S. No.	Course Code	Course Title	L	T	P	Cr	FM	Overall Pass Marks	Internal	External		Categorisation
			Hours per week						FM	FM	PM	
01	BSM01	Engineering Mathematics -I	3	1	-	4	100	35	30	70	21	BSC
02	BSP01	Engineering Physics	3	0	-	3	100	35	30	70	21	BSC
03	ESEE1	Basics of Electrical Engineering	2	0	-	2	100	35	30	70	21	ESC
04	ESEM1	Engineering Mechanics	3	0	-	3	100	35	30	70	21	ESC
05	ESPP1	Programming for problem solving	2	0	-	2	100	35	30	70	21	ESC
06	HSM01	Indian Knowledge System	2	0	-	2	100	35	30	70	21	IKS
Total			15	1	-	16	600		-	-	-	-
Practical			**L**	**T**	**P**	**Cr**	**FM**		**Internal**	**External**		**Categorisation**
7	BSP01P	Engineering Physics	0	0	2	1	50	25	25	25		BSC
8	ESEE1P	Basics of Electrical Engineering	0	0	2	1	50	25	25	25		ESC
9	ESEM1P	Engineering Mechanics	0	0	2	1	50	25	25	25		ESC
10	ESPP1P	Programming for problem solving	0	0	2	1	50	25	25	25		ESC
11	VSC01	Data Visualization and Pre-processing	0	0	2	1	50	25	25	25		VSEC
12	CCA01	Sports/NSS/NCC/YOGA/Painting/ Music/Classical dance	0	0	2	1	50	25	25	25		CCA
Total			-	-	12	06	300		-	-	-	-
Grand Total			15	1	12	22	900		-	-		-

Note :- Apart from the above 6 hours will be dedicated for the activity like group discussion/ Seminar / PD/Soft Skills/studio activity (alternate day).
One faculty of humanities and one faculty of concerned department
For Internal examination two class test and two assignments are to be conducted. Weightage of test will be 5% each and for the assignment 5% each of the total marks allotted and 10% for attendance.

Semester II

S. No.	Course Code	Course Title	L	T	P	Cr	FM	Overall Pass Marks	Internal	External		Categorisation
			Hours per week						FM	FM	PM	
01	BSM02	Engineering Mathematics II	3	1	-	4	100	35	30	70	21	BSC
02	BSC02	Engineering Chemistry	2	0	-	2	100	35	30	70	21	BSC
03	BSB02	Biology for Engineers	2	0	-	2	100	35	30	70	21	BSC
04	ESEL2	Elements of Electronics Engineering	2	0	-	2	100	35	30	70	21	ESC
05	ESED2	Engineering Drawing and Computer Graphics	1	0	-	1	100	35	30	70	21	ESC
06	PCEL2	Fundamentals of measurement and sensors	2	0	-	2	100	35	30	70	21	PCC
Total			12	1	0	13	600		-	-	-	-
Practical			**L**	**T**	**P**	**Cr**	**FM**	**Overall Pass Marks**	**Internal**	**External**		**Categorisation**
07	BSC02P	Engineering Chemistry	0	0	2	1	50	25	25	25		BSC
08	ESEL2P	Elements of Electronics Engineering	0	0	2	1	50	25	25	25		ESC
09	ESED2P	Engineering Drawing and Computer Graphics	0	0	4	2	50	25	25	25		ESC
10	PCEL2P	Fundamentals of measurement and sensors	0	0	2	1	50	25	25	25		PCC
11	HSM02	Communication Skills #	0	0	2	1	50	25	25	25		AEC
12	CCA02	Sports/NSS/NCC/YOGA/Painting/Music/Classical dance	0	0	2	1	50	25	25	25		CCA
13	INT02	Summer Internship@	Min. 4 weeks			02						
Total			-	-	18	9	300		-	-	-	
Grand Total			12	1	18	22	900		-	-		-

Note :- **Apart from the above 6 hours will be dedicated for the activity like group discussion/ Seminar/PD/Soft Skills/studio activity (alternate day).**

#One faculty of humanities and one faculty of concerned department.

@For every 20 students one faculty will assign by the concerned department.

Exit option to qualify for Certification (Any three skill based courses):

EOPCB: Printed Circuit Board (PCB) Design and Production (3 Credits) activity

EOELW: Electrical Workshop (3 Credits)

EOINW: Instrumentation Workshop (3 Credits)

EOCPP: Python Programming (3 Credits)

BSM01 Engineering Mathematics I

Course Outcomes:

Students should be able to

1. **Apply** concepts of linear algebra in physical and engineering problems.
2. **Develop** the essential tool of matrices and linear algebra in a comprehensive manner.
3. A**nalyze** the dynamics of real world problem using concept of Differential Calculus of two or more variables.
4. **Evaluate** the volume and surface area of the solid using double and triple integral.
5. **Familiarize** the students with line, surface and volume integral using Green's, Gauss and Stoke's theorem in different field of Science and Engineering such as electromagnetic theory and fluid dynamics.

Unit 1 **(12L+4T)**

Matrices and Linear Algebra:

Matrices: Elementary operations, Gauss Elimination, Rank of matrices: Echelon form, Normal form, Determinants, Consistency and solution of system of linear equations, Eigen values, Eigen vectors, Caylay-Hamilton theorem. Vector space, subspace, linearly independent and dependent vectors. Basis and Dimensions, Rank-Nullity theorem.

S: Basic properties of matrices, Elementary transformation, Determinants.

Unit 2 **(12L+4T)**

Differential Calculus:

Expansion of functions of one variable using Taylor's and Maclaurin's series, Asymptotes, Curve tracing, Limit and continuity of function of two variables, Partial and Total derivatives, chain rule, Jacobian, Taylor's theorem, Maxima and minima of two variables, Method of Lagrange's multipliers.

S: Higher order derivatives, Limit and continuity of two variables, Jacobian.

Unit 3 **(18L+6T)**

Integral Calculus:

Beta and Gamma functions, Evaluation of Double integrals in Cartesian and Polar co-ordinates, Change of order of integration, Evaluation of Triple integrals in Cartesian, Spherical and Cylindrical co-ordinates, Change of Variables, Applications to Area, Volume, surface area and Center of Mass. Vector differentiation, Gradient, Divergence and Curl, Line Integrals and Arc Length Parameterization, Surface Integral, Volume Integral, Path independence, Statements and illustrations of theorems of Green, Stokes and Gauss, applications.

S: Beta and Gamma function, Area, Volume, Surface area.

Textbooks:

1. Advanced Engineering Mathematics (10th edition) by Erwin Kreyszig, Wiley Eastern Ltd.

Reference Books:

1. Serge Lang, "Linear Algebra" Springer , 3rd edition
2. Gilbert Strang," Linear Algebra and its applications", Cengage Learnings RS, 4th edition
3. Howard Anton and Chris Rorres ,"Elementary Linear Algebra ",John Wiley, and sons, 10th edition
4. K. D. Joshi , "Calculus for Scientists and Engineers" , CRC Press
5. Sudhir Ghorpade and Balmohan Limaye , "A course in Calculus and Real Analysis"1st edition, Springer-Verlag, New York.
6. Ram, B; Engineering Mathematics, Dorling Kindersley (India), Pearson Education.

BSP01 Engineering Physics

Course Outcomes:

Students should be able to

1. Apply the concepts of Quantum mechanics to one dimensional motion of electrons
2. Classify solids on the basis of Band theory and to calculate carrier concentrations
3. Evaluate the electrical conductivity and identify the type of semiconductor
4. Implement the fundamentals of LASER for different applications

Unit 1 **(8hrs)**

Quantum Mechanics: Matter waves, Properties of matter waves, Physical significance of wave function. Schrödinger's time dependent and time independent equations, Operators, Eigen values and Eigen functions, Expectation values, Applications of Schrödinger's equation; Motion of a free particle, Electron in an infinite deep potential well (rigid box), Electron in a finite deep potential well (non-rigid box)

Unit 2 **(7 hrs)**

Solid State Physics: Lattice parameters, Miller indices, inter planer distance of lattice plane, density of crystals (linear, planar and volume), S*o*mmerfield's free electron theory, Density of states (3D), Fermi-Dirac probability function, Nearly free electron theory (E-k curve), classification of solids on the basis of band theory

Unit 3 **(8 hrs)**

Semiconductor Physics: Electron and hole concentrations in semiconductors, intrinsic density, intrinsic and Extrinsic conductivity, Position of Fermi level in intrinsic and extrinsic semiconductors, Law of mass action, Temperature variation of carrier concentration in extrinsic semiconductors, Electrical conduction in extrinsic semiconductor, Hall Effect

Unit 4 **(7hrs)**

Laser Physics: Introduction to laser, Spontaneous and stimulated emission of radiations, Thermal equilibrium, Condition for Light amplification, Population inversion, Pumping (Three level and four level pumping), Optical resonator, Laser beam characteristics, Ruby laser, Nd-YAG Laser, He-Ne Laser, Semiconductor Laser, Engineering applications of Laser (Fiber optics, Laser material interaction)

Learning resources:

1. Introduction to quantum mechanics / David J. Griffiths
2. A text book of Engineering physics, Avadhanulu and Kshirsagar, S. Chand Pub.
3. Concepts of Modern Physics, Arthur Beiser; Tata McGraw – Hill Edition.
4. Introduction to Solid State Physics, Charles Kittel, Wiley.
5. Solid State Physics, S. O. Pillai, New Age International Publishers.
6. Solid state electronic devices, Ben G. Streetman, Sanjay Banerjee Pearson Prentice- Hall.
7. LASERS Theory and Applications, K. Thyagarajan, A. K. Ghatak; Macmillan India Ltd.
8. Mechanical Vibrations Theory and Applications, Francis S. Tse, Ivan E Morse, Rolland T. Hinkle

BSPP1: Engineering Physics Laboratory

Course Outcomes:
Students should be able to

1. Calculate energy gap, carrier concentration and mobility of the given material.
2. Verify quantum mechanical phenomena.
3. Estimate the size of the object using Laser diffraction.
4. Determine the magnetic susceptibility and dielectric constant of the material

List of Experiments:

1. Frank-Hertz Experiment
2. Planck's Constant
3. To determine the wavelengths of light of a given source using diffraction grating
4. Band gap of a semiconductor by four probe method
5. Hall effect in Semiconductor
6. Magnetoresistance measurement of semiconductor
7. To determine the reverse saturation current and material constant of PN Junction
8. To determine the dielectric constant of material
9. Study of Biot-Savart's law
10. Measurement of magnetic susceptibility by Quinke's method

Course Objectives:

1. To provide an experimental foundation for the theoretical concepts introduced
2. To achieve hands-on experimental skills and the study of practical applications will bring more confidence.

ESEE1 Basics of Electrical Engineering

Course Outcomes

At the end of the course, students will demonstrate the ability to

1. Analysis of AC and DC circuits.
2. Apply the principles of electric and magnetic circuits to solve engineering problems.
3. Analysis and acquire knowledge about transformer.
4. To understand the basics of rotating electrical machines.
5. Use of relevant protective devices for electrical installations.

Unit1 **(5 hrs)**

DC Circuits: Electrical circuit elements (R, L, and C), voltage and current sources, Kirchhoff's laws, analysis of simple DC circuits: Superposition, Thevenin and Norton theorems, Maximum Power Transfer theorem, Star-Delta transformation.

Unit2 **(6 hrs)**

AC Circuits:

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, R-L, R-C, R-L-C combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections, three-phase power.

Unit3 **(6 hrs)**

Magnetic Circuits and Transformers: Magnetic materials, B-H curve, hysteresis loop, series and parallel magnetic circuits, ideal and practical transformer, emf equation, equivalent circuit, losses, regulation and efficiency of a singal phase transformer. Autotransformer and three-phase transformer connections.

Unit4 **(6 hrs)**

Rotating Electrical Machines: Construction, types, characteristics and applications of DC motors. Three-Phase induction motors: construction, types, principle of operation, slip, torque-slip characteristics and applications.

Unit5 **(5 hrs)**

Electrical Wiring and Safety: Types of wires and cables, Copper conductor sizes and rating, earth wires, Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Lightning protection. Types and characteristics of Batteries, elementary calculations for energy consumption, UPS types and specifications. Electrical safety measures, Earthing and its importance, first aid treatment after electrical shock, basic concept of electric grid.

Textbooks:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2nd Edition2019
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,4th Edition,2019

Reference Books:

1. Vincent Del Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd Edition, 2015.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2nd Edition, 2003.

ESEP1 Basics of Electrical Engineering

List of Experiments: (Any 10 Expriments)

1. Overview of the Basic Electrical Engineering Lab and safety precautions.
2. To verify Network Theorems: KCL, KVL and Superposition Theorems
3. To connect a simple DC circuit with two loops and more than one source and to measure all the branch currents and node voltages.
4. To verify Thevenin's and Norton's Theorems.
5. To verify Maximum power transfer Theorems.
6. To study the construction of DC and AC Electrical Machines.
7. To measure voltage, current, and power in the R-L, R-C and R-L-C series circuits and observe the phase difference between voltage and current using CRO.
8. To connect three-phase induction motor in star and delta and measure line and phase voltages and currents to verify the relationship between line and phase quantities.
9. To determine the efficiency and regulation of a single-phase transformer by direct loading.
10. Starting, reversing and speed control of DC motor.
11. Starting and reversing of three-phase induction motor and measurement of slip at different load conditions.
12. To connect the single-phase load bank through a switch-fuse unit, MCB and ELCB and check their operation in case of overload, short circuit, and earth leakage.
13. To study different types of earthing.
14. To study electrical sub-station.

ESEM1 Engineering Mechanics

Rationale:
Introduce students with basic engineering environment and simple engineering problems
Enable them to apply basic principles of general physics in solving simple engineering problems

Course Objective:
This course is expected to enable the student to

- Understand the force systems and draw free body diagram to analyze rigid body equilibrium.
- Comprehend the priciples of coloumb friction and solve engineering mechanics problems associated with frictional force
- Analyse simple structures like beams and trusses
- Understand the concept of dynamics of particles.

Course Outcomes:
Students should be able to

1. Apply Mechanics principles to find resultant and equilibrium of 2D force system
2. Evaluate forces in statically determinate trusses, beams and apply priciples of dry friction in basic engineering problems
3. Solve engineering problems on motion of a particle
4. Apply principles of dynamics in analyzing simple engineering systems

Unit 1 **(12 hrs) 20 marks**

Force system: Forces, Free-Body Diagrams, Moment, Couples, Resultant and Equilibrium of Two dimensional force System, Equivalent Force system

Unit 2 **(8hrs) 14 marks**

Structures in Equilibrium: Beams and Trusses, Dry Friction for inclined planes, Belt friction

Unit 3 **(10hrs) 16 marks**

Motion of a Point: Position, Velocity and Acceleration, Straight Line motion, Curvilinear Motion, Cartesian coordinates, normal & tangential coordinates and, polar coordinates. Relative motion

Unit 4 **(12 hrs) 20 marks**

Forces, Mass and Acceleration: Newton's second law, Work-Energy Principle, Impulse- Momentum Principle, Direct central impact.

Textbooks:

1. Hibbeler R. C., "Engineering Mechanics - Statics", Prentice Hall ,14th Edition
2. Hibbeler R. C., "Engineering Mechanics - Dynamics", Prentice Hall ,14th Edition
3. Beer F. P., Johnston E. R. et al., "Vector Mechanics for Engineers: Statics Dynamics", McGraw-Hill Publication, 12th Edition

Reference Books:

1. Meriam J. L., Kraige L. G., "Engineering Mechanics - Statics ", John Wiley and Sons, 8th Edition
2. Meriam J. L., Kraige L. G., " Engineering Mechanics - Dynamics ", John Wiley and Sons, 8th Edition
3. Bedford and W. Fowler, "Engineering Mechanics - Statics and Dynamics", Pearson Publications
4. Irving H shames ,Engineering Mechanics and Dynamics ,Prentice Hall.

ESMM1: Engineering Mechanics Laboratory

Course Outcomes:

Students will demonstrate the ability to:

1. Verify principles of mechanics through experiments.
2. Solve simple engineering problems using graphical solution techniques.
3. Solve simple engineering problems using computer programs.

PART A: Experiments (Any six)

1. Verification of law of polygon of forces
2. Verification of law of moments
3. Study of Space force system
4. Determination of beam reactions
5. Belt friction
6. Determination of shear force and bending moment of beam
7. Verification of Newton's second law of motion
8. Moment of inertia of flywheel
9. Coefficient of friction
10. Simple machine (Screw Jack)
11. Stiffness of spring
12. Young's Modulus

PART B: Assignments

There will be six assignments, based on graphical and computer solutions of Engineering Mechanics problems. Each assignment shall have a minimum of two problems.

ESPP1 Programming for Problem Solving

Course Outcomes:

Students should be able to

1. To develop simple algorithms, flowchart for arithmetic and logical problems.
2. To implement conditional branching, iteration and recursion.
3. To test and execute the programs and correct syntax and logical errors.
4. Design a modular solution using functions, by breaking down the problem into parts, using programming language.
5. To use arrays, pointers and structures to develop algorithms and programs and ability to process files of various types.

Unit 1 **[6L]**

Understanding a problem: Framing a problem in simple terms – mathematical, graphical, other abstractions. Number systems. Syntax errors and runtime errors. Algorithms, Properties/characteristics of Algorithms, Flowchart and Pseudo code, Algorithmic representation of the programs.

Basic steps in program execution: Editing, compiling/interpreting/running programs, OS view and programmer's view.

Unit 2 **[8L]**

Basic Problems: Basic Data types (Numerical, String). Variables, Operators, Expressions, Statements, I/O statements for keyboard handling.

Conditional statements: Decision Making Statements (if-Statements, if-else Statements, Nested if Statements)

Iteration and Loops : use of While, do-While and FOR loops, multiple loop variables, use of break and continue statements.

Unit 3 **[8L]**

Array techniques: Arrays (1D and 2D), Array as homogenous collection of elements, Array representation in memory, Array properties, Reversing elements of an array.

Search problems: linear search, linear search in sorted array, binary search.

Sorting: Insertion, Bubble, Selection sorts

Unit 4 **[6L]**

Functions: Introduction to functions. Importance of design of functions. Functions (including using built-in libraries), Parameter passing in functions, call by value, call by reference. Passing arrays to functions.

Recursion : Recursive functions (Finding Factorial, Fibonacci series, Ackerman function, etc).

Unit 5 **[8L]**

Pointers : Idea of pointers, Defining pointers, Use of Pointers in Array.

Structure : Defining structures and Array of Structures

File Handling : Introduction to File Handling Some problems to read data from files.

Textbooks:

1. R. G. Dromey, "How to solve it by Computer", Pearson Education, ISBN 0-13-433995-9
2. Byron S. Gottfried, "Programming with C", Schaums Outlines Series, Tata McGraw Hill

Reference Books:

1. Stephen G. Krantz, "Problem Solving Techniques" , Universities Press.
2. Kernighan and Ritchie, "The 'C' programming language", Prentice Hall

ESCP1 Programming for Problem Solving

The course involves writing code for solved, unsolved and practice programming problems given in the lab manual.

List of suggested experiments

1. Write a program to enter two numbers and perform all arithmetic operations.
2. Program to find area of a triangle using Heron's Formula
3. Take two integers as input and divide the first by the second. Prevent division by zero.
4. Write a program to print `n' terms of an Arithmetic series, with the first term `a' and a constant difference `d'. Take `a,d,n' from user.
5. Take a real value `x' from the user and find the value of tan (x), log (x), square root of x
6. Write a program to display all the prime numbers between 1 and 100
7. Write a program to take as input, 10 integers and put them in an array and display their values. Then, find the sum of all elements in the array and the position of the largest element. (Hint: use the logic of the algorithm to find maximum)
8. Declare a 3x3 matrix. Initialize it to zero using nested loops. Then fill some user- given values into it. Print the matrix in proper format to make sure the inputs are correctly taken.
9. Write your own function to find the minimum element of an array of integers. (Input to the function is integer array, output is the position number of the minimum element)
10. Declare an array of 10 integers. Declare a pointer and point it to the base of the array. Print all the elements of the array using this pointer and not using the original name of the array.
11. Write a program to sort a given set of structures on a given key-pair, using bubble sort.
12. Write a recursive function to raise a number to a given power.
13. WAP to compare the contents of two files and determine whether they are same or not.
14. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

HSM01 Indian Knowledge System

Unit 1		**04 Hrs**
Basics of Ancient Indian Knowledge and Diverse Fields from Health (Yoga), Agriculture, Performing Arts etc.	:	Yoga - Patanjali and Panini, Yoga Sutras & Mahabhashya, Yoga from Ancient Rishis, Munies, Sages and Seers, Different types of Yogas, Asanas & Pranayamas, Vagbhata Samhita for Health Benefits. Agriculture - Ancient Agricultural Trends, Practices & means of Transportation in Agriculture. Performing Arts – Different types of Ancient Arts, i.e; Murtikala, Embossing in Jewellery, Different School of Arts in Ancient India : Mathura, Gandhara and Amravati School, Pottery & Utensil making from Mud.
Unit 2		**08 Hrs**
Ancient Indian Knowledge in Various Science Streams like Physics, Chemistry, Biology, Forestry, Mathematics etc.	:	Gravitational Laws, Concept of Pendulum, Ancient knowledge of Space & Astronomy related to Outer Space and different Celestial Bodies, i.e; Planetary System, Stars and their Movement. Chemistry – Ancient Knowledge of Rasayanas, Preservative Methods using Oil and Salt etc. Biology & Forestry – Rich Cultural Heritage of Ayurveda, Different types of Medicinal uses of Plants, Fauna, Flora. Study of Animal and Plant Fossils, Interaction/ Inter-relation of Mankind and Nature on Mutually Beneficial Basis. Traditional methods for conservation of Forests, Trees and Preventing Soil Erosion. Mathematics – Present Day Decimal System traces its History to Ancient India, Giving the concept of Zero as a number to the World, Negative Numbers, basic Arithmetic and Algebraic concept, Knowledge of Advance Trigonometry in Ancient India.
Unit 3		**08 Hrs**
Ancient Indian Knowledge in Civil Engineering, Metallurgy, Mechanical Sciences, Textile Technology etc	:	Civil Engineering Concept and Familiarity with Sthapaty Kala, the Art of Construction in Ancient India, Civil Engineering Knowledge in Architecture in Making a Well Planned City by the Harappan Civilization Remains Undisputed. World Heritage Sites of Ajanta, Ellora, Khajuraho, Sanchi, Mahabalipuram are the Testaments of Excellent Civil Engineering Craftsmanship and Architecture, Well Developed Architecture During Cholas, Pal Dynasty is Evident in Various Ancient Temples in Present India. Concept of Canals and Wells for Irrigation & Human Needs in Ancient India is Well Documented Metallurgy – Concept Well Mentioned in Vedic Age Texts Using the Term Ayas for Metals, Minting/ Metal Casting Of Gold, Silver, Bronze, Copper for Utensils and Jewellery During Ancient India. Mechanical Sciences – Agriculture and Military Equipments like Hammer, Tongs, Idea of Basic Mechanical Concept for Transportation Using Bullock-Carts, Handpulled Carts Using Wheels, Chariots, Boats Using Patwar (Rudder) During Vedic Age ss Well Known, Use of Ploughing Tools Made of Metals and Wood etc. Textile Technology – Archaeological Evidence of Cotton Textile at Mohenjo Daro in the Indus Valley, Use of Charkhas and Traditional Yarns like Khadi, Silk Fabric from Silk Worm and export of quality Silk to West and European Countries is well established.
Unit 4		**08 Hrs**
Ancient Indian Knowledge in Electrical, Electronics, Computational Studies, Instrumentation etc.	:	Ancient India Knowledge in Generation of Electricity from Water, Silk and Clouds, Agastya Samhita Speaks about Electroplating, Basic knowledge of Computations and Instrumentation during Vedic Period, Musical Instruments like Seven-Holed Flute and other Stringed Instruments like Ravanahatha, Cymbals, Dhol (Drum) found by Archaeologists from Indus Valley Civilization Sites.

VSC01 Data Visualization and Pre-processing

Course Outcomes:

At the end of the course, students will demonstrate the ability to

1. Identify the importance of data visualization and pre-processing
2. Select and use appropriate visualization Techniques
3. Apply data visualization techniques for analysing the data
4. Interpret results of exploratory data analysis.
5. Apply different pre-processing techniques on data

Unit 1 (3hrs)

Introduction to data visualization: Data and Information, Types of data, Quantitative or Categorical data, Collection of Data, Representation of Data. Overview of data visualization and its importance, advantages and disadvantages. Data visualization steps.

Unit 2 (3 hrs)

Data Visualization Techniques: Graphs and charts for categorical data, bar charts, line plots, scatter plots, pie chart, Scatter plots, histograms, interactive data visualization.

Unit 3 (4hrs)

Data Visualization Tools: Tableau, Looker, Microsoft Excel (and Power BI), google charts. Top data visualization Libraries, Different types of graphs and charts in data visualizations.

Unit 3 (4hrs)

Introduction to Data Pre-Processing: Importance of data pre-processing operations, Challenges and issues. Data pre-processing techniques (data cleaning, data integration, data reduction, Data Reduction Strategies).

Textbooks:

1. Kieran Healy, “Data Visualization: A Practical Introduction”, Princeton University Press 2018.
2. Dr. Shirshendu Roy, “Data Visualization: Using Power Bi Orange and Excel”, Notion Press, 2021.
3. Daniel Garfield, “Data Pre-processing: Enhancing Data for analysis. The Art of Pre-processing”, 2023

Reference Books:

1. Min Chen, Helwig Hauser, Penny Rheingans, “Gerik Scheuermann,‘Foundations of Data Visualization”, Springer, 2020
2. Andy Kirk, “Data Visualization: A Handbook for Data Driven Design” , SAGE Publication, 2019
3. Alexandru C. Telea, “Data Visualization: Principles and Practice”, CRC Press, 2014
4. Stephen Few, “Information Dashboard Design: Displaying Data for At-a-Glance Monitoring”, Analytics Press; 2nd edition , 2013
5. Ben Fry, “Visualizing data: Exploring and explaining data with the processing environment”, O'Reilly, 2008
6. Pang-Ning Tan, Michael Steinbach, Vipin Kumar “Introduction to Data Mining”, Pearson Addison-Wesley, Second Edition

VSCP1: Data Visualization and Pre-processing

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Classify and transform the given data into visual presentation using visualization tools
2. Prepare dashboard to visualize summarized data
3. Perform pre-processing operations on data

List of Experiments:

1. Download any free data set (from tableau/kaggle etc)in excel format and prepare the following: bar charts, area chart ,pie charts ,line plots, scatter plots
2. Download any free data set and prepare the following: Heat map, Tree map, Histogram
3. Study of any of the visualization tools like Tableau, Power BI, Domo, Excel
4. Use of Python libraries such as Matplotlib, Seaborn, Plot to visualize data in the given dataset
5. Prepare a Dashboard using any one sourse software e.g. Tableau, Microsoft POWER BI, Google data Studio
6. Install WEKA on your system and study different features
7. Use WEKA tool for feature extraction and filtering

Resources:

- Kalilur Rahman, 'Python Data Visualization Essentials Guide: Become a Data Visualization expert by building strong proficiency in Pandas, Matplotlib, Seaborn, Plotly, Numpy, and Bokeh, BPB Publication, 2021
- Ryan Sleeper, 'Practical Tableau'O'Reilly Media Inc, 2018
- Bostjan Kaluza, 'Instant Weka How-to', Packt Publishing, 2013

CCA01

Sports/NSS/NCC/YOGA/Painting/Music/Classical dance

Jharkhand University of Technology, Ranchi
B. Tech. First Year

Branch: EE, EEE, ECE, CSE, IT, Cybersecurity
Data Science

Revised
Semester: II

Session: 2023-2024

BSM02 Engineering Mathematics II

Course Outcomes:

Students should be able to

1. **Design, Classify** and **Develop** the linear differential equation of first order for the real life problems
2. **Evaluate** the analytical solution of two-dimensional heat flow problem and wave problems using variable separable method.
3. **Analyze** periodic phenomenon of forces, electric currents, voltage, wave motion, sound waves in the form of trigonometric function using Fourier series.
4. **Introduce** and **apply** the distribution function in statistical analysis.

Unit 1 **(18L+ 6T)**

Ordinary Differential Equations:

First order Ordinary Differential Equations: Homogeneous, Linear, Exact ; Higher order linear equations with constant coefficients, Euler-Cauchy equations, Non homogeneous higher order linear differential equations with constant coefficients (method of undetermined coefficients and method of variation of parameters), Applications to Initial and boundary value problems: Orthogonal Trajectories, Statement and Application of Newton's Law of Cooling, Growth and Decay, Kirchhoff's Law, Simple Electrical Circuits, Heat Flow, Rectilinear Motion, Simple Harmonic Motion.

S: First order Ordinary Differential Equations - Variable Separable, Homogeneous, Linear

Unit 2 **(18L+ 6T)**

Partial Differential Equations:

Fourier Series, Dirichlet's condition, Half range series, Formulation of Partial differential equation, Solution of First order partial differential equations, Quasi-linear differential equations, Second order differential equations and canonical form. Initial and Boundary value problem, Method of separation of variable, Dirichlet's problem, Poisson's Equation, Vibrations of a String, One dimensional heat equation, Two- dimensional heat equation (Laplace Equation) under steady state conditions.

S: two-dimensional heat equation (Laplace Equation) under steady state conditions

Unit 3 **(6L+ 2T)**

Probability:

Random variables, Probability distributions, Expectation and variance, Moment Generating Function, Binomial distribution, Poisson distribution, Normal distribution and Exponential distribution.

S: Basic concept of Probability, Conditional Probability, Exponential distribution

Textbooks:

1. Erwin Kreyszig , "Advanced Engineering Mathematics", Wiley eastern Ltd ,10th edition

Reference Book:

1. Maurice D. Weir, Joel Hass, Frank R. Giordano, "Thomas' Calculus ",14th edition Pearson Education.
2. P.N. Wartikar and J.N. Wartikar ,"Applied Mathematics", Vidhyarthi Griha Prakashan Pune ,Vol.1 (Reprint July 2014)
3. Ross S.M., "Introduction to probability and statistics for Engineers and Scientists", Elsevier Academic press, 8th Edition, 2014
4. Ram, B., Engineering Mathematics, Dorling Kindersley (India), Pearson Education.

BSC02 Engineering Chemistry

Course Outcomes:

Students should be able to

1. Impart an understanding of Engineering chemistry's fundamental concepts, analytical methods and technological features.
2. Develop the capacity to analyze engineering problems based on the knowledge of chemistry.
3. Develop problem-solving ability.
4. Keep students abreast of the newest advancements and uses of contemporary materials

Unit 1 **(7hrs)**

Analytical Techniques for Engineers:

- Role of materials in engineering fields.
- Quality control and assurance in engineering contexts.
- Qualitative and quantitative analysis
- Emerging trends and applications of analytical techniques for engineering.
- Instrumental methods of analysis: spectroscopy (UV and IR), chromatography (GLC and HPLC), Thermo-gravimetry: TGA

Unit 2 **(7 hrs)**

Corrosion and material protection

- Introduction to corrosion and its impact on engineering materials
- Mechanism, Types/forms of corrosion, Factors that enhance corrosion and choice of parameters to mitigate corrosion.
- Corrosion prevention techniques, advanced surface coatings and corrosion inhibitors
- Case studies and real-world applications in corrosion prevention

Unit 3 **(8 hrs)**

Electrochemical energy systems

- High energy electrochemical energy systems: Lithium-ion batteries principle, construction, working, advantages and applications, Na-ion Battery, fiber battery
- Fuel cells-working principles, advantages, applications, discuss its emerging trends.
- Solar cells, Types Importance of silicon single crystal, polycrystalline and amorphous silicon solar cells- working principles, characteristics and applications
- Green Chemistry & brief study of green hydrogen technology.

Unit 4 **(7 hrs)**

Nanomaterials

- Nanomaterials, classification, Nanoscale phenomena and quantum effects
- Top-down and bottom –up approach, Synthesis methods: ball milling, RF sputtering, pulsed laser deposition, thin film deposition
- Applications of nanomaterials in various fields.
- Fundamentals of Super capacitor and materials used in super capacitor, Synthesis of a super capacitor.
- Study of green nanotechnology, its application and synthesis

List of Recommended Books:

1. Willard Dean, Merrittee, "Instrumental Methods of Chemical Analysis",Tata McGraw Hill Limited.
2. Gurdeep R. Chatwal,"Instrumental Methods of Chemical Analysis",Himalaya Publishing House.
3. Jain and Jain "A textbook of Engineering Chemistry", Dhanpatrai Publication.
4. S. S. Dara , "A textbook of Engineering Chemistry", S. Chand Publication 2010 ed.
5. Shashi Chawla, "A textbook of Engineering Chemistry", Dhanpatrai Publication.
6. Prof. Jianmin Ma, "Battery Technologies: Materials and Components", Wiley
7. Charles P. Poole, Frank J. Owens "Introduction to Nanotechnology"
8. Shripad Revankar, Pradeep Majumdar , "Fuel Cells"
9. Fuel Cell Fundamentals-Ryan O'Hayre, Suk-Won Cha
10. Suddhasatwa Basu, "Recent Trends in Fuel Cell Science and Technology"

BSCP2: Engineering Chemistry Laboratory

Course Outcomes:

Students will demonstrate the ability to

1. Apply theoretical knowledge for practical use and solve engineering problems.
2. Design and carry out scientific experiments, accurately record and analyze the results of experiments.

List of Experiments (Minimum 8 experiments should be perform)

1. To prepare a solution of NaOH and find the concentration of a given solution of sodium hydroxide by titrating it with the standard solution of oxalic acid using phenolpthalein as indicator.
2. To find the concentration of a given solution of Hydrochloric acid by titrating it with the standard solution of $Na_2CO_3.10H_2O$ using methyl orange as indicator.
3. To find the concentration of a given solution of potassium permanganate by titrating it with the standard solution of Mohr's salt.
4. Synthesis of complex compound (copper ammonium complex).
5. Synthesis of polymer (Phenol formaldehyde/urea formaldehyde resin).
6. Synthesis of aspirin.
7. To determine the pH value of given sample of food stuff.
8. To determine the cloud point and pour point of given lubricating oil.
9. To determine the surface tension and viscosity of given sample
10. Flash point-fire point and cloud point-pour point of fuel/lubricant
11. To determine the chloride content of given water sample.
12. To determine the saponification/acid value of given oil sample

Course Educational Objectives:

CEO1: To impart an understanding of Engineering chemistry's concepts, analytical methods and technological features.
CEO2: To acknowledge Laboratory Safety rules.

BSBB2 Biology for Engineers

Course Outcomes:

Students should be able to

1. Understand the overlapping areas between biology and engineering
2. Observe the principles of biological organization with lessons of increasing efficiency of engineered technologies
3. Analyze the analogies between biological and engineering processes
4. Explore the basic biological principles as guiding elements for engineering structures and processes
5. Appreciate the technological optimization of living systems

Unit 1 **(4 hrs) marks 12**

Crosstalk between Biology and Engineering:

a) Biologically inspired technologies: Case studies of designs in nature and inspired technologies, Biomemetics: Nature inspired material and mechanisms, Self-cleaning surfaces; Self-healing Bioconcrete, Biomining, Algorithms in nature,

b) Contribution of engineering in biological domain: Contribution of Microscope, Imaging techniques, Bio-medical Instruments, Mechanisms (Ergonomics)

Unit 2 **(6 hrs) marks 17**

Organization of Living Machines:

Biomolecules and manufacturing of Biopolymers:

- Carbohydrates (structure-based function and engineering applications)
- Lipids (structure-based function and engineering applications)
- Proteins (structure-based function and engineering applications)
- Nucleic Acids (structure-based function and engineering applications)
- Basics of forensic science and DNA fingureprinting.
- DNA vaccine ,RNA vaccine.

Organization of life forms: Cell to organism

Bioenergetics- Energy dynamics in biological system- principles of energy conservation and optimization

Unit 3 **(4 hrs) marks 12**

Analogy of biological organ/system and engineering Device/Mechanism:

Organ & system: Brain & CPU, Eye & Camera, Kidney & Filtration system, Lungs & purification system, Heart & Pumping system Process: Photosynthesis & solar cells, Xylem & plumbing, Thermoregulation in human body & heat transfer in machine, Defense mechanism in organism, signaling processing in biology and electronics

Unit 4 **(4 hrs) 12 marks**

Concepts in Bioengineering:

Biomechanics: Mechanical properties of tissues, Prosthesis and rehabilitation

Bioprinting: 3D printing of biological tissues and organ engineering and transplanting

Biomaterials: Types, properties and applications

Tissue Engineering: Principle, Components, Methods of Scafold synthesis, properties and applications.

Unit 5 **(6 hrs) 17 marks**

Application areas of Bioengineering:

Databases & Biocomputing: Acquisition, storage, processing and transmission of biological data and its applications like PCR

Bioinstrumentation: Diagnostic and Therapeutic devices

Bioimaging: Principle, types and examples

Biosensors: Principle, types and examples

Computational biology and application of Artificial Intelligence in bio-medical field

Suggested learning resources:

1. Lodish H, Berk A, Zipursky SL, et al. (2000)“ Molecular Cell Biology” W. H. Freeman
2. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000),“Lehninger principles of biochemistry” New York: Worth Publishers
3. Lewin B. (2000) “Genes VII” Oxford University Press
4. Rao CNR, et.al. , “Chemistry of Nanomaterials: Synthesis, Properties and Applications”
5. Eggins BR. (1006) , “Biosensors: An Introduction”, John Wiley & Sons Publishers
6. Palsson B.O. and Bhatia S.N. (2009) “Tissue Engineering” Pearson

7. Text book of Biophysics by R.N Roy,
8. Principles and techniques of Biochemistry and molecular biology,Wilson and walker.

ESEL2 Elements of Electronics Engineering

Course objective:

- This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, FET, MOSFET and fundamental power electronic devices.
- It will build mathematical and numerical background for design of electronics circuit & component value.
- Students equipped with the knowledge and training provided in the course will be able to participate in design, development and operation in the different area of electronics system.

Course Outcomes:

Students should be able to

1. Illustrate the band theory of solids and the carrier concentration in solids.
2. Articulate and estimate the charge distribution and charge transfer process in semiconductors.
3. Analyze the characteristics of PN junction diode and junction transistor.
4. Use diodes in different applications.
5. Realize the working principle of Power electronics devices

Unit 1 **(8 hrs) 19 marks**

Semiconductor Physics

Classification of Solids, intrinsic and extrinsic semiconductors, equilibrium carrier concentration, Mass action law, Fermi-Dirac probability function, Temperature dependence of carrier concentration, direct and indirect band-gap semiconductors, Carrier Transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations, Diffusion length and mean life time, Tunneling process.

Unit 2 **(8 hrs) 19 marks**

Semiconductor Diodes

Formation of p-n junctions, position of Fermi level in equilibrium, V-I characteristics in forward and reverse bias, Capacitances in p-n junction diode, Zener diode, Zener diode as a voltage regulator, Applications of special purpose diodes viz. PIN diode, Schottky diode, Gunn diode, LED, Laser Diode, photo diode, Tunnel diode, and solar cell, Diode Circuits: clipping, clamping, voltage multiplier and rectifiers.

Unit 3 **(8hrs) 19 marks**

Junction Transistors

Structure of NPN and PNP Transistors, BJT Configurations, Operation of BJT Common Emitter Configuration, V-I characteristics, Introduction to FET and MOSFET, Application as a switch.

Unit 4 **(6hrs) 13 marks**

Fundamentals of Power electronics Devices & Integrated circuits

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT. Square wave generator using 555 IC.

Textbooks:

- Millman &Halkies, "Electronic Device and Circuits", 4th edition, Tata McGraw Hill.
- Electronics: Fundamentals And Applications By D. Chattopadhyay, P. C. Rakshit,, New Age International Pvt Ltd Publishers

Reference Book:

- Millman Halkies, "Integrated Electronics", Tata McGraw Hill.
- Boylestead&Nashelsky, "Electronic devices and Circuits Theory", 8th edition, PHI
- Streetman, Ben G., and Sanjay Banerjee. "Solid state electronic devices", 6th edition. New Jersey: Prentice hall.
- Electronic Devices And Circuits , by David A. Bell, Oxford publisher

ESTP2: Elements of Electronics Engineering Laboratory

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Identify Passive and active basic components along with measuring equipment.
2. Design basic circuits using diodes
3. Identify and characterize basic devices such as BJT and FET from their package information by referring to manufacturers' data sheets.
4. Identify and characterize basic power electronic devices & ICs

List of Experiments:

1. Introduction to various electrical passive components such as Resistors, inductors and capacitors, introduction to active components, introduction to breadboard, Measurement of resistance using the colour code, series and parallel connection of the resistances and its implementation on breadboard. Exposure to usual electronic equipment/instruments such as Multi-meter, Oscilloscope, Function generator, Power supply.
2. To Design clipping circuits - Single ended clipping, Double ended clipping, and clamping circuits.
3. To observe the effect of Variation of Frequency and Load Regulation for Voltage Multiplier.
4. To observe the output voltage of a half wave rectifier and center tapped full wave rectifier with and without capacitor filter. Calculate V_{dc} and I_{dc}.
5. To observe Input and Output Characteristics of BJT in CE configuration and Find h parameters from characteristics.
6. To observe Transfer and Drain Characteristics of MOSFET and Find gm, rd and μ from characteristics.
7. To observe characteristics of SCR.
8. To observe characteristics of DIAC and TRIAC.
9. To observe characteristics of UJT.
10. To design square wave generation circuit using IC-555.

ESED2 Engineering Drawing and Computer Graphics

Course Rationale:

Introduce students to technical drawing principles by incorporating both traditional drafting methods and Computer-Aided Drafting techniques. Illustrate and exemplify the visualization and creation of multi-view, isometric, and section drawings. Clarify and demonstrate the theory and application of dimensioning, emphasizing the significance of standards within the contemporary technical drawing landscape.

Course Objectives:

This course enables the students

1. To gain familiarity with a range of drawing tools, various technical standards, and essential procedures for creation of diverse geometries and engineering objects.
2. To develop the ability to visualize and articulate three-dimensional shapes and their cross-sections by applying orthographic projections.
3. To learn techniques to create isometric projections from orthographic views.
4. To illustrate proficiency in depicting lateral surfaces indifferent design assemblies and cutting sections of diverse geometric solids, relevant to engineering applications.
5. To demonstrate adeptness in producing 2D and 3D drawings through the utilization of computer-aided drafting tools, highlighting proficiency in contemporary drafting technologies.

Course Outcomes:

Students should be able to,

1. Familiarize with different drawing tools, technical standards and procedures for construction of different geometries and engineering objects.
2. To understand basics of orthographic projection using projection of point and lines in different orientation.
3. Develop the ability to visualize and communicate three dimensional shapes and their sections by representing three-dimensional objects into two-dimensional views using, concept of orthographic projection.
4. Apply the visualization practices to draw isometric projection from a given orthographic views.
5. Draw 2D and 3D drawings using computer aided drafting tools.

Unit 1 **(2 hrs)**

Introduction to Engineering Drawing: Drawing tools, conventions, lettering, systems and rules of dimensioning

Unit 2 **(4 hrs)**

Projection of Points and Straight Lines : Projection of points in different quadrants, Projection of straight lines in different orientations

Unit 3 **(4 hrs)**

Orthographic Projections: Principles of Orthographic Projections, types of orthographic projections–First angle and third angle projections, Obtaining orthographic projections of given solids and machine elements by using first angle projection method along with sectional views. Basic drawing commands and its applications to draw 2D views using CAD software

Unit 4 **(4 hrs)**

Isometric Projections: Principles of Isometric projection – Isometric and natural Scale, Isometric views of simple and compound solids, drawing isometric views from given orthographic views. Basic drawing commands and its applications to draw 3D views using CAD software

Textbooks:

- N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishing House, Anand (India)
- M.L.Dabhade, “Engineering Graphics” I, Vision Publications, Pune
- Dhananjay Jolhe, “Engineering Drawing”, Tata McGraw Hill publishing company Ltd., New Delhi

Reference Books:

- Warren Luzzader, “Fundamentals of Engineering Drawing”, Prentice Hall of India, New Delhi.
- Shah, M.B. & Rana B.C. , “Engineering Drawing and Computer Graphics”, Pearson Education
- Agrawal B. & Agrawal C. M. , “Engineering Graphics”, Tata McGraw Publication
- Suraj Singh , “ Civil Engineering Building Practice ”,

ESDC2: Engineering Drawing and Computer Graphics

To draw 02 examples on each assignment on A3 size drawing sheet

Assignment 1:

Draw projection of points and lines in different positions and in different quadrants.

Assignment 2:

Draw orthographic views of any machine elements along with sectional view.

Assignment 3:

Draw isometric view for given orthographic views.

Assignment 4: (Programme specific assignment, One example only)

- Draw a plan, elevation, section of single storey building.(For Civil Engineering)
- Conventional representation of piping layouts, pipe fittings, valves, joints. Stuffing box & glands, Expansion joints etc (For mechanical , Manufacturing , Metallurgy and Robotics and Automation)
- Engineering drawings such as complex circuits/schematic/layout drawings, process flow diagrams (PFDs), sensor diagrams (SDs) and piping and instrumentation diagrams (P & IDs) (For Electrical , Electronics and Instrumentation Engineering)

Complete the following assignment by using CAD software (04 examples each)

Assignment 1:

Draw orthographic views of any machine elements along with sectional view.

Assignment 2:

Draw isometric view for given orthographic views.(3D drawings)

Assignment 3: (Programme specific assignment, One example only)

- Draw a plan, elevation, section of single storey building. (For Civil Engineering)
- Conventional representation of piping layouts, pipe fittings, valves, joints. Stuffing box & glands, Expansion joints etc(For mechanical , Manufacturing , Metallurgy and Robotics and Automation) (For Electrical , Electronics and Instrumentation Engineering)
- Engineering drawings such as Complex circuit/schematic/layout drawings, process flow diagrams (PFDs), sensor diagrams (SDs) and piping and instrumentation diagrams (P&IDs)

PCMS2 Fundamentals of Measurement and Sensors

Course Objective:

- To introduce students to monitor, analyze and control any electrical system.
- To understand students how different types of meters work and their construction
- To provide a student a knowledge to design and create novel products and solutions for real life problems.
- To introduce students a knowledge to use modern tools necessary for electrical projects.

Course Outcomes:

At the end of the course, students will demonstrate the ability:

1. To have comprehensive understanding of measuring instruments, transducers, and their applications, enabling them to make accurate measurements and effectively analyze measurement systems.
2. To be proficient in utilizing various measurement techniques, including Wheatstone and Kelvin bridges, ohmmeters, and Q-meters, for precise resistance, inductance, and capacitance measurements.
3. Students will be equipped to select, operate, and understand a wide range of displacement measurement transducers for various engineering applications.
4. To make students proficient in using a wide array of velocity and acceleration measurement instruments.
5. To make students proficient in the application of diverse force and torque measurement methods and instruments.

Unit 1 (7 hrs) 16 marks

Introduction of measuring Systems: Measuring Instruments: Classification, Absolute and secondary instruments, indicating instruments, control, balancing and damping, constructional details, characteristics, Ammeters, voltmeters: (DC/AC) PMMC, MI, Electrodynamometer type, Wattmeter: Electrodynamometer type, induction type, single phase and three phase wattmeter. Concepts and terminology of transducer, sensor, Classification of transducers, static and dynamic characteristics, selection criteria, sources of errors.

Unit 2 (6 hrs) 14 marks

Resistance, Inductance & Capacitance Measurement: Wheatstone bridge, design, arrangement of ratio arms, Kelvin Bridge, Kelvin double bridge, series ohmmeter, shunt ohmmeter, DMM. Maxwell'sbridge, Hay'sbridge, Schering bridge,Q-meter.

Unit 3 (6 hrs) 14 marks

Displacement Measurement: Resistive: Potentiometer, Linear and rotary, Inductive: LVDT and Eddy current type Transducers. Capacitive: Capacitance pickups, Differential capacitive cells. Piezoelectric, Ultrasonic transducers and Hall effect transducers, Optical transducers.

Unit 4 (6 hrs) 14 marks

Velocity and Acceleration measurement: Moving magnet and moving coil, Electromagnetic tachometer, Photoelectric tachometer, Toothed rotor variable reluctance tachometer. Magnetic pickups, Encoders, Photoelectric pickups, stroboscopes and stroboscopic method, Shaft speed measurement.
Eddy current type, piezoelectric type, Seismic Transducer, Accelerometer: Potentiometric type, LVDT type, Piezo-electrictype.

Unit 5 (5 hrs) 12 marks

Force and torque measurement: Basic methods of force measurement, elastic force traducers, load cells, shear web, piezoelectric force transducers, vibrating wire force transducers, Strain gauge torque meter, Inductive torque meter, Magneto-strictive transducers, torsion bar dynamometer.

Textbooks:

- K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, 12th ed., 2005
- B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGraw Hill Education, 4th ed.,2016

Reference Books:

- E.O. Doebelin, "Measurement Systems", McGraw Hill, 6th ed.,2017

- D.Patranabis,"PrincipleofIndustrialInstrumentation",TataMcGrawHill,2nded.,1999
- A. J. Bouwens, "Digital Instrumentation", McGraw-Hill, 6th reprint,2008
- H S Kalsi, "Electronic Instrumentation", Tata McGraw-Hill, 4th ed.,2017
- Albert D. Helfrick, William David Cooper, "Modern electronic Instrumentation and Measurement Techniques" Prentice Hall, Second ed.,1990

PCMP2: Fundamentals of Measurement and Sensors Laboratory

Course Outcomes:

At the end of the course, students will able to:

1. Measure different electrical parameters and components
2. Characterize sensors and transducers
3. Measure velocity and force using corresponding measuring instruments
4. Characterize photo conductive Cell.

List of experiments

1. Measurement of AC Voltage using Electrodynamometer type Voltmeter.
2. Measurement of unknown Resistance using a Wheatstone Bridge
3. Measurement of Capacitance using a Schering Bridge.
4. Measurement of Inductance using a Maxwell's Bridge.
5. To study the Piezoelectric Sensor.
6. Measurement of Linear Displacement using an LVDT Transducer.
7. To study velocity measurement using a Photoelectric Tachometer.
8. To study force Measurement Using a Load Cell
9. To study photo conductive cell (LDR).
10. Measurement using proximity sensors (inductive/Capacitive) for an application

HSM02 Communication Skills

Course Outcomes:

At the end of the course, students will demonstrate the ability to

1. Recall and use basic language skills-listening, speaking, reading and writing and attempt tasks using grammar and vocabulary efficiently
2. Understand the concepts/ principles of communication skills and structure conversations effectively
3. Develop the knack to make their point of view clear to the audience and portray their communicative competence efficiently in front of a large audience on a variety of relevant situations
4. Analyze, apply and present themselves competently in all formal spheres

Unit 1		**02 Hrs**
Introduction to English for Engineers :Varieties and Registers of English, English for Specific Purposes (ESP): Business English	**:**	Idea of Sentences, Verbs, Parts of Speech, Voice, Narration, Transformation, Gerund, Participle, Non-finite, Modals, Articles, Punctuation, Common Errors, Sub-Verb Agreement, Noun-Pronoun Agreement. Vocabulary Building, Root Words, Words from Foreign Languages, Antonyms-Synonyms, Prefixes-Suffixes, Standard Scientific Abbreviations, Analysis and Synthesis of Sentences, Forms of Sentences, Transformation of Sentences, Sense of Syntax, Diction, Describing and Defining Scientific Objects/ Instruments. Business Correspondences – Daily/ Routine Workplace Correspondences, Business Letters, Resume/ CV Writing, Job Application/ Covering Letter, Preparing Agendas and Minutes of Meeting, Report Writing, Tender Writing, Notices etc
Unit 2		**04 Hrs**
Foundation of Communicative and Linguistic Ability Development: Types of Communication, Process of Communication, Barriers and ways to overcome them, Common Challenges: Phonological, Syntactic, Semantic and Pragmatic Errors	**:**	Foundation of Communicative & Linguistics Ability Development. Types of Communication – Oral, Written, use of symbols, body languages, facial expressions etc. Channels of Communication, Barriers of Communication, Strategies to tackle Barriers of Communication, Strategies for Effective LSRW Skills. Linguistics – Phonology, Morphology, Semantic, Syntactic, Vowels, Consonants, Dipthongs, Syllables, Phonetic and Phonemic Transcription of Words, Rhythm, Juncture, Pauses, Accentual Pattern.
Unit 3		**04 Hrs**
Advanced Speaking Skills: Nuances of Speaking Skills/ Public Speaking, Group Communication, Presentation Skills: The 4 P's of Presentation, Do's and Don'ts, Techniques for Effective Delivery	**:**	Accuracy and Fluency in Oral Communication, Clarity in Proper Articulation, Establish Connection with Audience, Understanding of British R.P. Conduct of Group Tasks including GDs, Debates, Extempore, Elocution etc Individual Tasks like Lecturettes. Basic techniques and tips for effective speaking and presentation. Understanding Presentation Skills – Projection, Pace, Pitch and Pauses, Supra Segmental Features
Unit 4		**04 Hrs**
Business Writing Development: Techniques of Writing: Note-making, Drafting, Editing, Paraphrasing and Proof-reading, Business Letters, e-mails and Brief Reports	**:**	Basic Mantra/ ABCs of Writing Skill – Accuracy, Brevity and Clarity. Internal and External Communication in an Organization, Note Making, Note of Action etc, Drafting letters, Different Elements of Letter Writing, Editing. Format, Layout, Spacing, numbering of paragraphs/ page numbers of letters, annexures & appendices of a letter. Avoiding use of Jargon and Cliches. Significance of Proof Reading, Paraphrasing etc. Letter to Civil Dignitaries, Formal and Informal Letters, Demi-Official Letters, writing e-mails, Tour Report and writing reports on various Visits, Inspections, Workshops, Seminars, Events in a flawless manner. Paragraph Writing, Essay Writing, Precis Writing, Importance of Organized and Effective Writing Business Correspondences.

HSMP2 Communication Skills
(Activity and Exposure Oriented T & L Methodology)

Unit 1		**(2 Hrs)**
Foundation of Language Learning Skills	**:**	Receptive Skills: Listening and Reading; Productive Skills: Speaking and Writing; Grammaticality and Appropriateness; Vocabulary Development
Unit 2		**(4 Hrs)**
Listening Skills	**:**	Stages of Listening (Pre, While and Post), Strategies to Develop Active Listening Skills, Problematic Sounds for Indian Users
Unit 3		**(4 Hrs)**
Speaking Skills	**:**	Oral Communication, Sounds in English, Pronunciation, Stress, Intonation and Pauses, Formal and Informal Expressions, Situational Conversations, Group Discussion
Unit 4		**(4 Hrs)**
Reading and Writing Skills	**:**	Reading Techniques: Scanning and Skimming, Active Reading; Common Problems in Reading; Stages of Writing (Pre, While and Post), 7 Cs of Effective Communication; Letter/ e-mail Writing- Drafting, Editing, Summarizing