Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

NEP Compliant Structure & Syllabus

of

Department of Engineering, Sciences & Humanities (DESH)

Pattern 'A-24'

F. Y. B. Tech.

Effective from Academic Year 2025-26

Prepared by: - Board of Studies in Engineering, Sciences & Humanities

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Chairman- BoS **Dean - Academics** **Chairman – Academic Board**

Contents

Program Outcomes:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

FF No.: 653

Structure of First Year for Academic Year 2025-26

Course Code	Course Name	Type	Teaching Learning Scheme				
			Th	Tut	Lab	Hrs. / Week	Credits
Module 1							
HS1084	Linear Algebra	**BSE**	3	1	0	4	4
CS1012	Problem Solving and Programming	**ESE**	3	0	2	5	4
XX1016	Computer Organization and Architecture	**PCC**	2	0	0	2	2
XX1016	Electronic Circuits	**PCC**	2	0	0	2	2
XX1016	Mechanical Systems Engineering	**PCC**	2	0	0	2	2
XX1016	Engineering Mechanics	**PCC**	2	0	0	2	2
XX1015	Web Development	**VSEC**	1	0	2	3	2
XX1015	Electronics Hardware Workshop	**VSEC**	1	0	2	3	2
XX1015	Mechanics of Machine Elements	**VSEC**	1	0	2	3	2
XX1015	Surveying	**VSEC**	1	0	2	3	2
HS1073	Indian Knowledge Systems	**HSM**	2	0	0	2	2
HS1083	Student Activity	**CC**	0	0	2	2	1
Module 2							
HS1085	Calculus	**BSE**	3	1	0	4	4
ET1012	Applied Electromechanics	**ESE**	3	0	2	5	4
CS1018	Python for Engineers	**PCC**	1	0	2	3	2
XX1017	Data Analysis	**VSEC**	1	0	2	3	2
XX1017	Digital Logic Design and Testing	**VSEC**	1	0	2	3	2
XX1017	Engineering Graphics	**VSEC**	1	0	2	3	2
XX1017	Elements of Construction Engineering	**VSEC**	1	0	2	3	2
HS1073	Universal Human Values	**HSM**	2	0	0	2	2
HS1082	Environmental Studies	**CC**	1	0	0	1	1
Courses in Semester 1 Irrespective of Module							
ES1056	Scientific Research Methods 1	**ESE**	1	0	0	1	1
ES1057	Applied Science and Engineering Project 1	**BSE**	0	0	4	4	2
HS1072	Reasoning and Aptitude Development 1	**HSM**	0	1	0	1	1
HS1074	General Proficiency 1	**CC**	0	0	2	2	1
HS1027	Induction Training	**AU**	0	0	2	2	0
Semester 1 Total Credits (Module 1 / Module 2)			**12**	**2**	**14**	**28/29**	**20**
Courses in Semester 2 Irrespective of Module							
XX1015	Scientific Research Methods 2	**ESE**	1	0	0	1	1
XX1014	Applied Science and Engineering Project 2	**BSE**	0	0	4	4	2
HS1072	Reasoning and Aptitude Development 2	**HSM**	0	1	0	1	1
HS1080	General Proficiency 2	**CC**	0	0	2	2	1
HS1036	Indian Democracy and Constitution	**AU**	0	0	0	0	0
Semester 2 Total Credits (Module 1 / Module 2)			**12**	**2**	**12**	**26/27**	**20**

FF No.: 654

LINEAR ALGEBRA

Course Code: HS1084

Credits: 4	**Teaching Scheme: Theory: 3 Hours / Week** **Tutorial: 1 Hour / Week**

Section I

System of Linear Equations: Rank of matrix, Row Echelon Form, System of linear equations, Gaussian elimination method, Applications of System of Linear equations.

Vector Spaces: Introduction to vector spaces over reals (Euclidean Vector Space, Polynomial Space, Matrix Space, C[a,b]), Subspace, Linear combination, Spanning set, Linear dependence & independence, Basis & dimension of a vector space, Row space, Column space & Null space of a matrix.

Inner Product Spaces: Inner product spaces, Euclidean inner product spaces, Norm, Distance, Angle, Projection, Orthogonal and Orthonormal vectors, Orthogonal Complement, Gram-Schmidt process of orthogonalization, Applications to least square fitting to data.

Section II

Linear Transformation: Introduction to linear transformations, Matrix representation relative to Standard Basis, Kernel and Range of linear transformations, One-One-Onto linear transformations, Rank-Nullity Theorem, Regular Transformation, Composite linear transformation, Orthogonal Transformation, Geometric Linear transformations in R^2.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a matrix, Algebraic and geometric multiplicity, Cayley-Hamilton Theorem, Diagonalization of a matrix, Orthogonal diagonalization.

Quadratic Forms: Introduction to Quadratic forms, Nature of quadratic forms, Canonical form, Applications of quadratic forms: Principal Axes Theorem, Singular Value Decomposition.

List of Tutorials:

1. Row Echelon Form, Rank of matrix.
2. Solution of System of linear equations & Applications of System of Linear equations.
3. Subspaces.
4. Basis and dimension of a vector space; Row Space, Column Space and Null Space of a Matrix.
5. Norm, Distance, Angle between two vectors and Orthogonality.
6. Gram Schmidt Process, least square method.
7. Linear transformations, Matrix of Linear Transformation.
8. Rank -Nullity Theorem, Basis and dimensions of Kernel and Image of linear Transformation.
9. Eigen Values and Eigen Vectors of a matrix, Algebraic and geometric multiplicity.
10. Cayley Hamilton Theorem, Diagonalization of a matrix.
11. Matrix and nature of quadratic forms, Canonical forms.
12. Principal Axes Theorem, Singular Value Decomposition.

Text Books:

1. Elementary Linear Algebra by Howard Anton & Chris Rorres, John Wiley & sons.
2. Linear Algebra and its Applications by David C. Lay, Pearson.

3. Linear Algebra and its applications (4th edition) by Gilbert Strang, Cengage Learning.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, John Wiley & Sons.

Reference Books:

1. Schaum's outlines of Linear Algebra (6th edition) by Seymour Lipschutz, Marc Lipson, McGraw-Hill Education (India) Private Limited, New Delhi.
2. Linear Algebra: A Modern Introduction (4th Edition) by David Poole, Linear Cengage Learning
3. Linear Algebra: An Introduction by Ron Larson and David C. Falvo, Cengage Learning
4. Higher Engineering Mathematics.by B. V. Ramana., Tata McGraw Hill Publisher

Course Outcomes:

The student will be able to -

1. Set up, solve and analyse linear systems of equations.
2. Understand the concepts of vector spaces, subspaces, spanning set, basis, linear dependence & independence.
3. Apply knowledge of inner product spaces to compute length of a vector, angle, distance between two vectors, to compute orthogonal basis using gram-schmidt process.
4. Demonstrate linear transformations geometrically and find basis and kernel of linear transformation.
5. Compute eigen values and eigen vectors and apply it for diagonalization of matrices and singular value decomposition.
6. Apply knowledge of quadratic forms in various real-life applications

FF No.: 654

PROBLEM SOLVING AND PROGRAMMING

Course Code: CS1012

Credits: 4 **Teaching Scheme: Theory: 3 Hours / Week**

Laboratory: 2 Hours / Week

Section I

Problem Solving and Logic: Skills required for a software engineer: Technical Skills, Problem Solving Skills and Soft Skills. Problem and Types of Problem: Social Problem, Management Problem and Computational Problem. Examples of Computational Problems: Decision Problem, Searching and Sorting Problem, Counting Problem, Optimization Problem. Introduction to Problem-Solving: Problem-solving Life Cycle, TOP-DOWN Approach. Logic: Importance of Logic in Problem Solving, Positive logic, Negative logic. Algorithms: Definition, Use of Algorithm, Need of algorithm, Properties (Characteristics) of Algorithms (Finiteness, Definiteness, Input, Output and Effectiveness.) Flowcharts: Flowchart symbols, Flowcharts for different algorithms or problems.

Introduction to computer-based problem solving: Program design and implementation issues, Pseudocodes. Programming Fundamentals: Structure of C program, Header files and preprocessor directives. Compiler, Interpreter, Assembler, Loader, Linker. Writing and executing the first C program. Syntax and logical Errors, Object and executable code.

Fundamentals of C Language and Programming Constructs: Tokens in C: Identifiers, Keywords (Variable declaration, initialization and manipulation of data.), Constants, Strings, Operators, special symbols. Data types: Primary (Integers, floats, characters, double etc.), Secondary and User Defined data types. Operators and expressions: Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Conditional Operators (Ternary Operator), Assignment Operator, Special operators (Comma, dot, arrow, sizeof, asterisk, addressof operators) Operator precedence and associativity, Expression formation and evaluation. Control Structure: Conditional Branching: Decisions making using if, if-else, nested if-else, else-if ladder, switch-case, goto, continue and break statement, difference between else-if ladder and switch-case. Iterative Loops: for, while and do-while loop, nested loops, Comparison of different loops.

Section II

Functions in C: Declaration, Definition, function call statement. Types of functions (User defined and library function (math.h or string.h or conio.h). Different Parameter passing and returning values from functions. Concept of call by value and call by reference. Array as a function parameter, returning array from function. Recursion: Definition, declaration of recursive function, implementing recursion to solve problems, such as factorial of given number and Fibonacci series. Advantage and Limitation of function and recursion.

Structures and union: General Syntax for Structure declaration, variable declaration and initialization of structure variable. Memory representation for structure variable. Accessing structure members using structure variable and array of structure, nested structure. Union: syntax, variable declaration and memory representation for union variable. Difference between structure and union.

Pointers: Definition, Declaration, applications of pointers. Pointer arithmetic, Pointer to array, Pointer to Function, Dynamic memory allocation (malloc, calloc, realloc and free functions).

File handling: Introduction of files (FILE Pointer), Text File creation using fopen (), Operations on file (Read, write, append), Reading and writing data to and from file (fscanf (), fprintf ()).

List of Practical:

1. To analyze problem solving and program structures.
2. Assignment based on operators and expressions.
3. Assignment based on control structures and loops.
4. Assignment based on arrays (1 D and 2D arrays).
5. Assignment based on functions and recursion.
6. Assignment based on structure and union.
7. Assignment based on pointers.
8. Assignment based on file handling.

NOTE: IDE for performing practical: **Turbo C/ VSCode/ Codeblocks**
Turbo C is Recommended

List of Projects Areas:

1. Science and Numeric Applications.
2. Number theoretic algorithms
3. 3D Graphics and Animations.
4. Large integer Arithmetic using string processing
5. Database/File Handling Application.
6. Game development using C
7. Desktop GUIs.
8. Solving statistical problems.

Text Books:

1. Dromey R G, How to solve it by computers, Prentice Hall, 2005.
2. Yashwant Kanetkar, Let us C, BPB Publication.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. An Introduction to Programming Through C++, Ranade Abhiram G., McGraw Hill Education India

Course Outcomes:

The student will be able to –

1. To analyze the problem and apply logic to build algorithm, flowchart and pseudocode
2. Analyze and convert a given problem statement into a program using operators and flow control statements.
3. Solve the applications using arrays.
4. Demonstrate modular programming approach using functions.
5. Make use of pointers to get insight into memory allocation.
6. Organize and manipulate data using files.

FF No.: 654

COMPUTER ORGANIZATION AND ARCHITECTURE

Course Code: XX1016

Credits: 2	**Teaching Scheme: Theory: 2 Hours /Week**

Section I

Basic Architecture Concepts and Instruction Cycle: Computer Organization and Architecture, Structure and Function, Evolution (A Brief History) Of Computers, Von Neumann Architecture, Interconnection Structures, Instruction Cycle, Instruction Pipeline, RAM Model, Evolution of Intel Processor Architecture-4 Bit To 64 Bit

Computer Arithmetic: Integer Representation, Integer Arithmetic: 2's Complement Arithmetic, Multiplication, Booth's Algorithm with Hardware Implementation, Division Restoring Algorithm with Hardware Implementation, Floating Point Representation: IEEE Standards for Floating Point Representations.

Processor Architectures: RISC Features, CISC Features, Comparison of RISC & CISC, Superscalar Processors, Super Pipelined Processor.

Fundamental Concepts and Processor Organization: Single Bus CPU Organization, Register Transfers, fetching a Word from Memory, storing a Word in Memory, Performing an Arithmetic/Logic Operation, Execution of a Complete Instruction. Micro-Operations, Hardwired Control, Micro-Programmed Control, Microinstructions.

Section II

Input and Output System: External devices, I/O modules, I/O module function and I/O module structure, Programmed I/O- overview, I/O commands, I/O instructions, Interrupt-driven I/O- design issues. Drawbacks of programmed and interrupt-driven I/O, Direct Memory Access- DMA functions, I/O channels, and processors**.**

Memory Organization: Need, Characteristics, Size, Access Time, Read Cycle Time, and Address Space. Principle of Locality of Reference, Main Memory: RAM – SRAM & DRAM, ROM and its Types, Cache Memory, Cache Organization, Address mapping techniques. Basic concepts, role of cache memory, Virtual Memory Concept.

Parallel Processing Paradigms: P-RAM model, Parallelism in Uniprocessor System, Evolution of parallel Processors, Architectural Classification, Flynn's Classification, Need and Basics of Multicore Architecture, Multicore Model, Case Study-CORE2DUO.

Text books:

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", 7th Edition, Pearson Prentice Hall Publication, ISBN 81-7758-993-8.
2. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", 5th Edition, Tata McGraw-Hill Publication, ISBN 007-120411-3.
3. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill ISBN 0-07-113342-9.

Reference Books:

1. Hwang and Briggs, " Computer Architecture and Parallel Processing" , Tata Mc Graw Hill Publication ISBN 13: 9780070315563.
2. A. Tanenbaum, " Structured Computer Organization ", Prentice Hall Publication , ISBN81–203 –1553 – 7, 4th Edition.

MOOCs Links and additional reading material:
1.www.nptelvideos.in 2. https://learn.saylor.org/ 3. https://www.coursera.org/ 4.https://swayam.gov.in/ 5. https://teach-sim.com/
Course Outcomes:
The student will be able to – 1. Demonstrate Computer Architecture concepts along with the Instruction pipeline. 2. Perform basic computer arithmetic operations using various related algorithms for computations and compare design principles of modern processors. 3. Describe the control unit operation and illustrate the micro-operations sequencing. 4. Discuss the Input and Output System and various I/O Mapping techniques. 5. Classify memories and discuss characteristics and hierarchical memory organization. 6. Classify and state the need and design of modern processor architecture.

FF No.: 654

ELECTRONIC CIRCUITS

Course Code: XX1016

Credits: 2	**Teaching Scheme: Theory: 2 Hours /Week**

Section I

Fundamentals of Electrical and Electronics Engineering: characteristics and specifications of the components: Resistor, capacitor and Inductor. Series and parallel combination and computation of equivalent value, star-delta arrangement (T and π) and simplification. Independent and Dependent sources: Voltage and current sources. Voltage, current and power computation. Concept of node and loop in a network. Solving simple resistive network using KCL and KVL to compute load current, load voltage and power.

Network Theorems: Classification of electrical networks: linear and non-linear; active and passive; unilateral and bilateral; lumped and distributed networks. Superposition, Norton's and Thevenin's and maximum power transfer theorem. Solve simple resistive networks and also use of dependent and independent sources.

Two Port Network: Concept of two port network, importance and use. Representation of two port network using Z, Y, H and ABCD parameters. Representation of the network using equations consists of these parameters. Computation of Z and H parameters.

Section II

Semiconductor devices: Construction of semiconductor diode, characteristics and applications. Rectifier circuit, computation of DC component. Concept of ripple and removal using RC filter. Clipper and clamper circuits.

Bipolar Junction Transistor (BJT): Construction of BJT, biasing, operating regions and commutation of the current and voltages to fix Q point. Amplifier configurations; CE, CB and CC. frequency response: Gain vs Frequency, and characteristics.

Transistor small signal amplifier: Common emitter configuration. Frequency response, effect of bypass capacitor. Representation of CE amplifier using '*h parameter'* model.

Text books:

1. M. E. Van Valkenburg, Network Analysis, 3rd Edition. New Delhi, India: Prentice Hall of India, 2006.
2. W. H. Hayt Jr., J. E. Kemmerly, and S. M. Durbin, Engineering Circuit Analysis, 8th Edition. New York, NY, USA: McGraw-Hill, 2012.
3. J. Millman, C. C. Halkias, and S. Jit, Electronic Devices and Circuits, 4th Edition. New Delhi, India: McGraw-Hill, 2015

Reference Books:

1. M. H. Rashid, Microelectronic Circuits: Analysis and Design, 3rd Edition. Stamford, CT, USA: Cengage Learning, 2011.
2. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuits, 9th Edition. Hoboken, NJ, USA: Wiley, 2014.
3. C. K. Alexander and M. N. O. Sadiku, Fundamentals of Electric Circuits, 6th Edition. New York, NY, USA: McGraw-Hill, 2016.

Course Outcomes:

The student will be able to –

1. Analyse electrical networks using Kirchhoff's Law.
2. Apply network theorems to solve electrical networks.
3. Analyse the two-port networks, and compute Z and H parameters.
4. Apply the knowledge of diode characteristics to develop different applications.
5. Illustrate the characteristics and operation of Bipolar Junction Transistors (BJT).
6. Analyse BJT circuits to find the Q point, and amplifier parameters.

FF No.: 654

MECHANICAL SYSTEMS ENGINEERING

Course Code: ME1019

Credits: 2	**Teaching Scheme: Theory: 2 Hours /Week**

Section I

Power generation systems: energy sources & its conversion, thermal energy, hydropower energy, nuclear energy, solar energy, geothermal energy, wind energy, hydrogen energy, biomass energy and tidal energy.

Fundamentals of thermal systems: Laws of thermodynamics, heat engine, heat pump, modes of heat transfer, conduction, convection and radiation, Fourier's law, Newton's law of cooling, Stefan Boltzmann's law. Two stroke and four stroke engines (Petrol, Diesel and CNG engines).

Electro-mechanical systems: electric drives, electrical vehicle, battery pack, pumps, compressors, refrigerator, air conditioners, blower, vacuum cleaner, washing machines, water heater, electric iron etc.

Section II

Automobile systems: engines, inlet outlet, combustion, chassis, suspension, clutch, brakes, steering, differential mechanism, seating etc.

Power transmission systems: Gear drives, belt-pulley, chain-sprocket, rope drives, velocity and transmission ratios, power screws, screw jacks etc.

Manufacturing systems: manufacturing machine tools, Metal cutting processes and machining operations, Turning, milling and drilling and 3D printing CNC/IOT based machines. Casting, forging, metal forming (Drawing, Extrusion, etc.), sheet metal working, metal joining, etc.

Text Books:

1. Nag, P. K., "Engineering Thermodynamics," Tata McGraw-Hill Publisher Co. Ltd.
2. Chaudhari and Hajra, "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers, Mumbai
3. Agrawal, Basant and Agrawal, C. M., (2008), "Basics of Mechanical Engineering", John Wiley and Sons, USA

Reference Books:

1. Pravin Kumar, (2018), "Basic Mechanical Engineering, 2nd Ed.", Pearson (India) Ltd.
2. Incropera, F. P. and Dewitt, D.P., (2007), "Fundamentals of Heat and Mass Transfer, 6th Ed., John Wiley and Sons, USA.
3. Groover,Mikell P., (1996), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA.
4. Juvinal, R. C., (1994), "Fundamentals of Machine Component Design", John Wiley and Sons, USA.
5. Ganeshan, V., (2018), "Internal Combustion Engines", McGraw Hill.
6. Anderson, Curtis Darrel and Anderson,Judy, (2010), "Electric and Hybrid Cars: A History", 2nd Ed., McFarland.
7. Srinivasan, "Automotive Engines", Tata McGraw-Hill Publishing Company Ltd.
8. "Modern Electric, Hybrid Electric and Fuel Cell Vehicles Fundamentals, Theory and Design" By MehrdadEhsani, YiminGao and AliEmadi.

Course Outcomes:
The student will be able to - 1. Identify the sources of energy and their conversions. 2. Explain the basic concept of engineering thermodynamics and its application. 3. Elaborate electro mechanical systems. 4. Understand automobile systems. 5. Describe the mechanical power transmission systems. 6. Synthesize manufacturing processes to produce components.

FF No.: 654

ENGINEERING MECHANICS

Course Code: CV1019

Credits: 2	**Teaching Scheme: Theory: 2 Hours /Week**

Section I

Force systems and its resultants: Introduction - Fundamental concepts, Laws of mechanics, system of units, force and its characteristics, system of forces, resolution and composition of forces, resultant of concurrent forces. Moment of a force, couple, Varignon's theorem, resultant of parallel and general force system.

Equilibrium: Free body diagram, equilibrium equations, Application of Lami's theorem, types of supports, types of loads – (point loads, uniformly distributed loads, uniformly varying load and moments only). Application of equilibrium equation to simply supported and cantilever beam.

Section II

Analysis of Systems: Friction: characteristics and laws of dry friction, coefficient of friction, angle of friction, friction on horizontal and inclined plane surfaces, wedge friction. Belt Friction

Analysis of Plane Truss: method of section and method of joint

Centroid and Moment of Inertia of Plane Lamina: Introduction, centroid of basic figures, centroid of composite figure, moment of inertia of simple geometrical figure, parallel axis theorem, perpendicular axis theorem, moment of inertia of composite figure.

List of Project Areas:

1. Composition of coplanar general force system.
2. Equilibrium of coplanar general force system/ Verification of law of polygon of forces.
3. Analysis of two force members.
4. Numerical examples on systems involving friction.
5. Centroid/centre of gravity by analytical/experimental/graphical method.

Text Books:

1. Mechanics for Engineers - Fourth Edition, by F. P. Beer and E. R. Johnson, McGraw-Hill Publication.
2. Engineering Mechanics - S. S. Bhavikatti, K. G. Rajashekharappa, New Age International (P) Limited Publisher
3. Tayal A. K., Engineering Mechanics- Statics and Dynamics, Umesh Publications

Reference Books:

1. Engineering Mechanics - statics and dynamics by J. L. Meriam and Craige, John Willey and Sons Publication.
2. Engineering Mechanics - Statics and dynamics by R. C. Hibbeler, McMillan Publication.

Moocs Links and additional reading material: https://www.pdd-resources.net/resources.html

Course Outcomes:

The student will be able to -

1. Classify force system and perform resolution and composition of coplanar force system
2. Apply concept of free body diagram and solve the equations of equilibrium
3. Analyse the practical example involving friction and application of two force members
4. Compute the centroid and moment of inertia of the plane lamina

FF No.: 654

WEB DEVELOPMENT
Course Code: XX1015

Credits: 2 **Teaching Scheme: Theory: 1 Hour / Week**
Lab: 2 Hours / Week

Section I

Unit-I: HTML5.x

What is HTML? What is website? Why to learn HTML? History of HTML, HTML4 document structure, What is an HTML element? What is an HTML Tag? HTML5 document structure, HTML elements:- The Root Element, Document Metadata Elements (Meta Tags), Sections Elements, Text-Level Semantic Elements(HTML -Basic Formatting Tags), Embedded Content Elements (Image iFrame and multimedia Tags), Tabular Data Elements, Grouping Content Elements(Grouping Tags) and Edit Elements.

Unit-II:CSS3.x

What is CSS? Why to learn CSS? Introduction to CSS, Difference between CSS2 and CSS3 versions, CSS3 Syntax, CSS3 Selectors, CSS3 Color Background Cursor, CSS3 Text Fonts, CSS3 List and Tables, CSS3 Box Model, CSS3 Display Positioning, CSS3 Floats and Clear Properties

Unit-III: JavaScript (Functional) ECMA 2024

What is JavaScript? Why to learn JavaScript? ECMA Script 2024, Writing first JavaScript Code: "Hello World", Declaring Variables in JavaScript, Data Types, Operators, Numbers, Strings, Booleans and advanced operators, Writing Statements, Conditional Statements using if-else and switch, Looping constructs: - for and while, nested loops; Arrays, Objects and functions, Array of Objects, Math Objects, String Objects, Bugs and Errors, Try and Catch block;

Section II

Unit-IV: JavaScript (Object Oriented) ECMA 2024

Object oriented programming, Classes, Constructors, Inheritance, De-structuring arrays and objects, For of loops and objects, Spread and Rest Operators, JavaScript modules, JavaScript DOM, DOM Manipulations, JavaScript Interactivity, JavaScript Selectors, JavaScript Object Notation(JSON)

Unit-V: JQuery 3.7.x

What is JQuery? Why to learn JQuery? Introduction to JQuery, Loading JQuery, selecting elements, changing styles, creating elements, appending elements, removing elements, handling events

Unit-VI: Bootstrap 4 and 5.

What is Bootstrap? Why to learn Bootstrap? What is Responsive Web Design? Mobile first approach, Containers:- Fixed and Fluid, Responsive Containers, Grid System, Text Typography, Text Colors, Contextual and background colors, Tables, Image, Alerts

List of Practical:

For Regular Lab:

1. Design and develop a website for various clubs in Vishwakarma Institute of Technology using **HTML only** without support of CSS.

2. Design and develop a website for various clubs in Vishwakarma Institute of Technology using **HTML and CSS Box** Structure and various elements. [Extension of assignment 1]

3. Design and develop a website for various clubs in Vishwakarma Institute of Technology using **HTML and CSS** Box Structure and various elements along with validation **using JavaScript** and having video at background. Store your credentials at client side only in htdocs folder. [Extension of assignment 2]

4. Design and develop a website for various clubs in Vishwakarma Institute of Technology using **Object oriented features of HTML,CSS and JavaScript** along with validation using JavaScript and having video at background. Provide an interactive facility **using CSS Selectors** to update club committee, to update success stories of the various clubs and e-mailing success stories to all VIT students. Store your credentials at client side only in htdocs folder. [Extension of assignment 3]

5. Design and develop a website for various clubs in Vishwakarma Institute of Technology using **Object oriented features of HTML,CSS, JavaScript and JQuery functions** along with validation and having video at background. Provide an interactive using CSS Selectors facility to update club committee, to update success stories of the various clubs and e-mailing success stories to all VIT students. Store your credentials at client side only in htdocs folder. [Extension of assignment 4]

6. Design and develop a **responsive website** for various clubs in Vishwakarma Institute of Technology using **Object oriented features of HTML,CSS, JavaScript, JQuery and Bootstrap functions** along with validation and having video at background. Provide an interactive using CSS Selectors facility to update club committee, to update success stories of the various clubs and e-mailing success stories to all VIT students. Store your credentials at client side only in htdocs folder. [Extension of assignment 5]

All students must make use of AI in Course Project in the following ways:

1. Automating Tasks:

Design: AI can assist with website design by suggesting layouts, optimizing images, and creating user-friendly interfaces (AI tools like ChatGpt, Gemini, FramerAI)

Code Generation: AI can automatically generate code snippets based on descriptions, saving developers time and effort. (AI tools like ChatGpt, Gemini, FramerAI,Claude ai)

Testing: AI-powered tools can automate testing processes, identify bugs, and ensure websites function correctly on different devices and browsers. (AI tools like ChatGpt, Replit)

Content Creation: AI can generate text, images, and videos for website content, making it easier to create engaging and informative material. (AI tools like ChatGpt, Gemini, FramerAI,Claude ai)

2. Enhancing User Experience:

Chatbots and Virtual Assistants: AI chatbots can provide instant customer support and answer frequently asked questions, improving user satisfaction. (AI tools like Tidio, ManyChat, Landbot, Botpress)

3. Improving Efficiency and Productivity:

Content Management: AI can automate content management tasks, such as updating website content and managing user interactions (AI tools like ChatGpt, Gemini,Claude ai).

4. Lovable ai: *Create apps and websites by chatting with AI.*

List of Project areas:

1. Develop a responsive web application for Sport Department of Goverment of India

2. Develop a responsive web application for Cultural Department of Goverment of India

3. Develop a responsive web application for Agriculture Department of Goverment of India

4. Develop a responsive web application for Finance Department of Goverment of India

5. Develop a responsive web application for GST Billing Software for Small Business

Textbooks:

1. *Kevin Wilson, The Absolute Beginner's Guide to HTML and CSS: A Step-by-Step Guide with Examples and Lab Exercises Kindle Edition, Publisher : Apress (7 April 2023), File size : 53019 KB, Text-to-Speech : Enabled, Screen Reader : Supported*
2. *Mary Delamater and Zak Ruvalcaba, Murach's JavaScript and jQuery (4th Edition), Published September 2020, ISBN 978-1-943872-62-6*
3. *Ben Frain, Responsive Web Design with HTML5 and CSS: Develop future-proof responsive websites using the latest HTML5 and CSS techniques, 3rd Edition Kindle Edition, Publisher : Packt Publishing; 3rd edition (30 April 2020)*
4. *Brad Traversy, Bootstrap 5 From Scratch - Build 5 Modern Websites,Released October 2023, Publisher(s): Packt Publishing, ISBN: 9781835460559*

Reference Books:

1. *Brad Traversy, Modern HTML & CSS From The Beginning 2.0 - Second Edition, Released July 2024, Publisher(s): Packt Publishing, ISBN: 9781835880562*
2. *Brad Traversy, Modern JavaScript from the Beginning - Second Edition, Released April 2023, Publisher(s): Packt Publishing, ISBN: 9781805127826*

MOOCs Links and additional reading material:

1. https://developer.mozilla.org/en-US/docs/Web/HTML
2. https://developer.mozilla.org/en-US/docs/Web/CSS
3. https://developer.mozilla.org/en-US/docs/Web/JavaScript
4. www.w3.org/html/
5. https://getbootstrap.com/
6. www.w3.org
7. www.w3.org/standards/
8. https://www.w3schools.com/
9. https://jquery.com/

Course Outcomes:

The student will be able to –

1. Create front end web pages using HTML tags and attributes (3)
2. Support styling for front end web pages using CSS tags and attributes(3)
3. Associate event handling using JavaScript for website development(3)
4. Update website content interactively using JavaScript selectors(3)
5. Make use of JQuery library functions for website development(3)

6. Design and develop responsive website using Bootstrap(6)

FF No.: 654

ELECTRONICS HARDWARE WORKSHOP

Course Code: XX1015

Credits: 2 **Teaching Scheme: Theory: 1 Hours /Week**
Lab: 2 Hours/Week

Section I

Unit 1: Electronic Components, Datasheets, and Applications

Component Deep Dive: Explore resistors, capacitors, inductors, diodes, and transistors (BJTs and MOSFETs). Learn their functions, common types, identification methods (like color codes and SMD markings), and key parameters.
Integrated Circuits (ICs) Unpacked: Get an introduction to the power of ICs, from logic gates to basic timers (like the 555), understanding their general functions and how to identify them.
Datasheets Interpretation: Learn to read and interpret critical information from component datasheets, including absolute maximum ratings, electrical characteristics, pin configurations, and typical application circuits. This skill is vital for design and troubleshooting.
Component Selection: Understand the principles for choosing the right components for your projects, considering factors like voltage, current, power, and precision.

Unit 2: Electronic Testing and Measuring Instruments

Digital Multimeter (DMM) Proficiency: Learn to use a DMM for the measurement of electrical parameters and testing of electronic components and electrical devices.
Oscilloscope Unveiled: Understand the applications of oscilloscope for visualization of electrical waveforms. Measurement of various parameters related to the signals/ waveforms. Applications of oscilloscope for testing electronic circuit
Function Generator Control: Understand how to use a function generator to create different electrical waveforms (sine, square, triangle) for testing circuits.

Section II

Unit 3: Electronic Circuit Design Using Linear Integrated Circuits

Introduction to Op-Amp, characteristics, and datasheet: Overview of the ideal and practical Op-Amp.,

Op-Amp Characteristics: Examination of key parameters, including input offset voltage, slew rate, common-mode rejection ratio (CMRR), and open-loop gain, **Datasheet Analysis:** How to read and interpret an Op-Amp datasheet to select the appropriate device for a given application.

Study of basic Op-Amp circuits such as comparator, Schmitt trigger, Non-Inverting Amplifier and Inverting Amplifier

Design of Regulated power supply using linear voltage regulator IC

Unit 4: PCB Design Fundamentals & Electrical Safety Essentials

PCB Basics: Learn about the types of PCBs (single-sided, double-sided, multi-layer) and their advantages in modern electronics, Introduction to software tools for PCB design, PCB Fabrication Process: Get a concise overview of how PCBs are physically made, from material selection to final testing.

Electrical safety and Grounding, various safety measures for prevention of electrical shock hazards and protection of sensitive electronic components from electrostatic discharge (ESD). Introduction to electrical circuit ground and safety ground (earthing)

List of Practical and Project work:

List of Practical

1.Study of Electronic Components, Cables and Connectors

2. Study of Electronic Testing and Measuring Instruments
3. Design and assembly of an electronic circuit on a Breadboard
4. Assembly of an electronics circuit on a general-purpose PCB
5 Study and Soldering of SMD components on a Printed Circuit Board (PCB)
6 Implementing Op-Amps: Comparators and Schmitt Triggers
7 Design and testing of Operational Amplifier Circuits
8. Electronic Control Circuit for DC Motor: Forward/Reverse and Speed Control

List of Project work:

1. Design of a regulated power supply
2. Design of an amplifier for a given application
3. Design of I/V or V/I converter
4. Design of a waveform generator
5. Any Simple electronic projects

Textbooks:

1. Simulation Software's Help Manual (Examples. Multisim, Proteus, Altium Design).
2. Principles of Measurement Systems by John P. Bently (Pearson).
3. "PCB Design and Layout Fundamentals for EMC", by Roger Hu,
4. Magazine (Examples. Everyday Practical Electronics, Elektor, Electronics For You, various online magazines)
5. Electronic Instrumentation; by H. S. Kalsi; McGraw-Hill Education India Pvt. Ltd.
6. Modern Electronic Instrumentation and measurement Techniques; by A.D. Helfrik and W.D. Cooper, PHI publication

Reference Books:

1. Electronic Components: A Complete Reference for Project Builders, DELTON T. HORN, Publisher: Tab Books
2. A Comprehensive Guide to Understanding Electronic Components on the Smartphone PCB: encyclopaedia of electronic components, by Muhammad Asif Azeemi, Publisher: Muhammad Asif Azeemi (8 February 2023)
3. Complete Book of Oscilloscopes, Stan Prentiss, Publisher: McGraw-Hill Education TAB; 2nd edition
4. Oscilloscopes: A Manual for Students, Engineers, and Scientists, David Herres, Springer Nature
5. Troubleshooting Analog Circuits: Edn Series for Design Engineers, by Robert A. Pease, Publisher : Butterworth-Heinemann Ltd; New ed. Edition
6. Electrical and Electronic Measurements and Instrumentation by A. K. Sawhney; Dhanpat Rai & Co.
7. "Printed Circuits Handbook, Seventh Edition: 50th Anniversary Edition (ELECTRONICS)", Clyde Coombs, Happy Holden, McGraw-Hill Education India Pvt. Ltd.
8. Instrumentation measurement and Analysis by B.C. Nakra, K.K.Chaudhary D. Roy Choudhury and Shail B. Jain, "Linear integrated Circuits," 5th Edition, New Age International Publishers
9. Practical PCB Design, by Michael D. Smith, Publisher : No Starch Press
10. Electronics for Dummies, by Cathleen Shamieh, Publisher : For Dummies; 3rd edition

Online materials:

1. BASIC ELECTRONIC COMPONENTS, MODEL ECK-10,

https://www.elenco.com/wp-content/uploads/2017/10/ECK-10_REV-O-2.pdf

2. Electronics Components – A Complete Guide Book,

https://www.enrgtech.co.uk/blog/electronics-components-a-complete-guide-book/

3. Component Manufacturer Datasheets

4. OSCILLOSCOPE INSTRUCTION MANUAL,

5. Test and Measurement Basics" (Online Resources/Application Notes)

6. NFPA 70E Electrical Safety in the Workplace,

https://safety.ep.wisc.edu/wp-content/uploads/sites/707/2017/03/36.-2015-NFPA-70E-Copy.pdf

Course Outcomes:

1. Identify and select electronics components for designing electronics circuits.

2. Operate electronic instruments for measuring electrical parameters and testing electronic components and circuits.

3. Assemble electronic circuits on a bread board and solder electronic component.

4. Select and design suitable printed circuit boards and practice various safety measures and precautions while testing and assembly of electronic circuits.

FF No.: 654

MECHANICS OF MACHINE ELEMENTS

Course Code: ME1020

Credits: 2 **Teaching Scheme: Theory: 1 Hour /Week**
Laboratory: 2 Hours /Week

Section I

Static Force Analysis: Fundamental concepts and laws of mechanics, Force Systems and Resultants, equivalent systems of forces, Equilibrium of Rigid body, Free body diagram, Analysis of Trusses and Frames;

Properties of Surfaces and Solids: Centroid, Moment of inertia, Polar moment of inertia; Friction; Principle of virtual work

Kinematics of Particle: Rectilinear motion: motion with uniform acceleration, gravitational acceleration and variable acceleration, curvilinear motion: rectangular components, motion of projectile, normal and tangential components.

Section II

Kinetics of Particle: Newton's second law of motion, equation of motion, Newton's law of gravitation, application of Newton's second laws to rectilinear and curvilinear motion, conservative and non-conservative forces, work energy principle, conservation of energy, impulse momentum principle and impact

Simple Stress and Strain under Axial Loading: Concept of stress and strain, types of stresses and strains, Thermal stresses, stress-strain diagram for ductile and brittle material, properties of material: Poisson's ratio, material strengths, proof stress

Equivalent Stresses: Factor of safety, stress analysis of axially loaded members Principal planes and planes of maximum shear, Principal stresses and maximum shear stresses

List of Practical

1. Tensile and compression test on UTM and plot the stress strain curve.
2. Impact tests to determine the fracture toughness of material
3. Hardness test
4. Demonstration of mechanics of metal cutting processes that uses tools like saws, lathes, and milling
5. cutters to remove material from a work piece, chip formation, plastic deformation, shear zones, heat and contact stress in the tool
6. Experiential learning of lathe machine operations (turning, drilling, tapping etc)
7. Metal welding
8. Casting processes
9. Sheet metal processes

Text books:

1. Engineering Mechanics, Ferdinand Singer, 3rd edition, Harper and Row
2. Engineering Mechanics (Statics and Dynamics) by Hibbeler R. C., Pearson Education
3. Mechanics of Materials, Nineth Edition, by James M Gere & Barry J Goodno, Publisher,
4. Global Engineering.
5. Engineering Mechanics: Statics & Dynamics, by R C Hibbler Prentice Hall publication

Reference Books:

1. Engineering Mechanics, S Timoshanko and Young, Tata McGraw Hill Education Pvt. Ltd. New Delhi.
2. Vector Mechanics for Engineers – Statics, Beer and Johnston, Tata McGraw Hill
3. Engineering Mechanics - Statics and Dynamics, Meriam J. L. and Kraige L.G., John Wiley and Sons
4. Vector mechanics for engineers – Statics & Dynamics, 12th edition, by Beer & Johnston, McGraw Hill Publication.
5. Mechanics of Materials, vol I & II, by E J Hearn, Butterworth Heinemann, Oxford.

6. Engineering Mechanics, Fifth edition by S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, Tata McGraw Hill publication.

Course Outcomes:

The student will be able to –

1. Carryout static force analysis under different loading conditions
2. Understand the concept of centroid and mass moment of inertia
3. Elaborate kinematics and kinetics of particles in terms of acceleration and work energy principle
4. Understand the stress-strain properties of material under different loading conditions
5. Determine principal stresses and maximum shear stresses
6. Understand the mechanics of metal cutting processes and manufacturing

FF No.: 654

SURVEYING

Course Code:CV1020

Credits: 2	**Teaching Scheme: Theory: 1 Hour/Week** **Laboratory: 2 Hours /Week**

Section I

Introduction – principles of survey, introduction to scale, classification, different terms used in surveying, types of maps and their uses, measuring areas from maps using digital planimeter.

Compass Surveying: Concept of bearing, meridian and their types, construction and use of prismatic compass, local attraction and correction for local attraction, dip, declination and calculation of true bearings.

Plane Table Surveying: Equipment required for plane table surveying and their uses, advantages and disadvantages, methods of plane table survey: Radiation and intersection method.

Section II

Levelling: Introduction to levelling, Types of levelling, Construction and use of auto level, laser level in construction industry, reciprocal levelling, curvature and refraction corrections, distance to the visible horizon, trigonometric leveling (Plane Survey)

Contouring: direct and indirect methods of contouring, uses of contour maps, study and use of topo-sheets, profile levelling and cross-sectioning and their applications.

Introduction to Modern Survey Methods using Total Station.

List of Practical (Any 6):

1. Study of any 4 types of Maps and their uses
2. Exercise on Chaining, Ranging and Offsetting
3. Measurement of areas of irregular figures using digital planimeter
4. Study of prismatic compass and measurement of magnetic bearings of sides of a polygon, correction for local attraction and calculations of true bearings.
5. Plane table survey by Intersection and Radiation method.
6. Differential/Profile levelling with at least two change points using digital/auto level.
7. Use of various functions of total station
8. Exercise on Box contouring

List of Project areas:

1. Plotting traverse
2. Preparing contour map

Text books:

1. R. Subramanian, (2007), “Surveying and Levelling”, Oxford University Press
2. Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain, (2005) “Surveying Vol. I and Vol. II”, Laxmi Publications Pvt Limited
3. N.N. Basak, (2014), “Surveying and Levelling”, McGraw Hill Education
4. S. S. Bhavikatti, (2010), “Surveying and Levelling”, I.K. International Publishing House Pvt. Limited

Reference Books:

4. J. Uren, W.F. Price, (2010), “Surveying for Engineers”, Palgrave Macmillan
5. S.K. Duggal, (2013), “Surveying Vol. I and Vol. II”, McGraw Hill Education
6. James McMurry Anderson, James M Anderson, Edward M Mikhail, (1998), “Surveying: Theory and Practice”, McGraw-Hill Education
7. Russell C. Brinker, (2013), “The Surveying Handbook”, Springer US

Course Outcomes:
The student will be able to – 1. Plot traverse using compass and plane table survey 2. Use & operate total station in the field. 3. Perform differential and profile levelling 4. Draw a contour map

FF No.: 654

INDIAN KNOWLEDGE SYSTEM

Course Code: HS1073

Credits: 2 **Teaching Scheme: Theory: 2 Hours/ Week**

Section I

Introduction to Indian Knowledge System:

Introduction to Vedas, A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Introduction to Vedāṅgas, Prologue on Śikṣā and Vyākaraṇa, Basics of Nirukta and Chandas.

Sanskrit Language – Origins, Structure and Unique Characteristics of the Sanskrit Language, Sanskrit Metrics, Vak and Mantra in Sanskrit Language

Ancient Indian Universities -Nalanda, Takahashila Vallabhi, Vikramshila, Jagaddala University, Nagarjuna Vidyapeeth, Kanthalloor University etc.

Arts, Literature, Culture and Scholars:

Sixty-four art forms (64 Kalas), Art, Music, and Dance, Naṭarāja– A Masterpiece of Bhāratīya Art, Literature, Life and works of Agastya, Lopāmudrā, Ghoṣā, Vālmīki, Patañjali, Vedavyāsa, Yājňavalkya, Gārgī, Maitreyī, Bodhāyana, Kauṭīlya, Pāṇini, Thiruvalluvar, Salient aspects of Indian Mathematics -Āryabhaṭa, Varāhamihira, Ādi Śaṅkarācārya, Bhāskarācārya, Mādhavācārya.

Science and Mathematics:

Number systems in India– Historical evidence, Concepts of Zero and Pi, decimal system, binary system, contributions in the area of arithmetic, algebra, geometry, trigonometry, combinatorial problems in Chandaḥ-sastra of Pingala, and Magic squares in India, Time – Concept of Kala, Cycles of Time, Measurement of Time, Knowledge of Time – the Science of Light, Concept of Matter, Life and Universe, Gravity, Sage Agastya's Model of Battery, Velocity of Light.

Section II

Engineering and Technology Heritage:

Pre-Harappan and Sindhu Valley Civilization, Laboratory and Apparatus, Juices, Dyes, Paints and Cements, Glass and Pottery, Metallurgy, bronze and copper artefacts, Engineering Science and Technology in the Vedic Age and Post-Vedic Records, Iron Pillar of Delhi, Rakhigarhi, Mehrgarh, , Marine Technology, and Bet–Dwārkā.

Bhāratīya Civilization:

Genesis of the land, Antiquity of civilization, On the Trail of the Lost River, Discovery of the Saraswatī River, the Saraswatī-Sindhu Civilization,Different dynasties, Mauryan age, Gupta age.

Indian conception of Economy and Management, Insights from Arthashastra, Management by Consciousness, Vāstu-śāstra – The science of architecture, Eight limbs of Vāstu , Temples in India: marvelous stone architecture for eternity, Temple architecture in India, Iconography.

Life, Environment and Health:

Concept of Nature in Indian Tradition, Panchbhutas – Elements of Nature, Concept of Rta, Sacred Environment, Panchvati, Ethnic Studies, Life Science in Plants, Anatomy, Physiology, Agriculture, Ecology and Environment,

Aurveda, Charaksamhita, Sushrutsamhita, Atrey, Nagarjuna, Kaṇāda , Patañjali.

Text Books:

1. Introduction to Indian knowledge system: concepts and Application, B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R.N, Publisher: PHI learning, 2023, ISBN: 9789391818203.

2. Traditional Knowledge System in India, Amit Jha, Atlantic Publisher, 2022, ISBN: 9788126912230
3. Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan.
4. Histrory of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).

Reference Books:

1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).
2. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).
3. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).

Course Outcomes:

The student will be able to –

1. Understand the rich heritage that resides in the culture of our country.
2. Learn to appreciate the need and importance of sanskrit in getting to the roots of the philosophical concepts
3. Understand the scientific value of the traditional knowledge of bhārata.
4. Understand the modern technological trends through indian scientific and technological philosophy.
5. Promote to do research in the various fields of bhāratīya knowledge system.
6. Convert the bhāratīya wisdom into the applied aspect of the modern scientific paradigm.

FF No.: 654

CALCULUS

Course Code: HS1085

Credits: 4	**Teaching Scheme: Theory: 3 Hours / Week** **Tutorial: 1 Hour / Week**

Section I

Infinite Series and Expansion of functions: Infinite Series, Tests of Convergence (Comparison & Ratio Test), Alternating series, Power series, Region of Convergence, Taylor's and Maclaurin's Series.

Partial Differentiation: Partial derivatives of first and higher orders, Euler's Theorem on homogeneous functions, Partial derivative of composite functions, Total derivative and implicit differentiation.

Application of Partial Derivatives: Maxima and minima of function of two variables, Lagrange's method of undetermined multipliers, Errors and approximations, Jacobian-properties & applications.

Section II

Vector Differentiation: Introduction to scalar point function and vector point function, Del Operator, Gradient, Directional Derivative, Divergence and Curl, Scalar Potential.

Multiple Integration and Applications: Double integration, Double integration by polar coordinates, Change of order of integration, Triple integration, Application of double integration to find area.

Linear Differential Equations and Applications: Linear differential equation, Equations reducible to linear form, Bernoulli's differential equation, Linear differential equation of higher order, Method of variation of parameters, Applications of differential equations.

List of Tutorials:

1. Convergence of infinite series
2. Maclaurin's and Taylor's series expansions
3. Evaluation of partial derivatives, Euler's theorem on homogeneous functions
4. Partial derivative of Composite functions, Total Derivative
5. Maxima and minima of functions of two variables, Lagrange's methods of undetermined multipliers,
6. Errors and approximations, Jacobian
7. Gradient & Directional Derivative
8. Divergence and Curl, Scalar Potential
9. Double integration and change of order of integration
10. Double integration by polar coordinates and application to find area
11. Differential equations reducible to linear form, Bernoulli's differential equation
12. Linear differential equation of higher order, Method of variation of parameters

Text Books:

1. Higher Engineering Mathematics by B.S.Grewal, Khanna Publisher.
2. Higher Engineering Mathematics by B.V.Ramana., Tata McGraw Hill Publisher
3. Higher Engineering Mathematics by H.K.Dass., S.Chand Publication

Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.

Reference Books:

1. Calculus: Early Transcendental by James Stewart, Cengage Learning
2. Advanced Engineering Mathematics by Peter O'Neil, Global Engineering, Publisher.
3. Textbook of Applied Mathematics (Volume I & II), by P.N.Wartikar & J.N. Wartikar Pune Vidhyarthi Griha Publisher.
4. Advanced Engineering Mathematics by M.Greenberg, Wiley Publications.

Course Outcomes:

The student will be able to -

1. Test the convergence of an infinite series and find expansion of functions.
2. Find of partial derivatives of functions of several variables.
3. Apply the knowledge of partial differentiation to find extreme values of the function of several variables, Jacobian, in estimating error and approximation.
4. Interpret physical phenomenon such as gradient, divergence, curl using the knowledge of vector Differentiation.
5. Evaluate multiple integrals and apply the knowledge of multiple integrals in its various applications
6. Solve higher order linear differential equations by suitable mathematical techniques

FF No.: 654

APPLIED ELECTROMECHANICS

Course Code: ET1012

Credits: 4 **Teaching Scheme: Theory: 3 Hours / Week**
Laboratory: 2 Hour / Week

Section I

Electromechanical systems: Block diagram representation, classification, configurations, and components (Mechanical, Electrical and Electronics), robot terminology, Analogy with human body, accuracy, precision, resolution, repeatability etc. Forward and Inverse kinematics. Introduction to transformation matrix.

Actuators: Pneumatic, Hydraulic, Electrical – Solenoid coil, Relay, Construction, Working principle of DC, BLDC, Stepper and Servo motors, Merits and Demerits, applications, and selection of actuators.

End effectors and robot controls: End effectors, classification, mechanical, magnetic, vacuum and adhesive gripper. Gripper force analysis and design. Robot control. Introduction to open loop and closed loop control system with examples.

Section II

Electronic devices and applications: Diodes, Zener Diode, LED, BJT, FET, MOSFET, IGBT, Op-amp. Digital Electronics: Logic gates, Basic gates using transistor, Flip-flop, Counters, Register, ADC, DAC

Microcontroller: ATmega328P, architecture, peripherals, ports, registers, memory types, timer/counter, PWM, interrupts, Serial I/O, I2C, SPI

Sensors: Proximity sensor (Range sensor), Tactile sensor (Contact sensor), light sensor (photo diode, IR, Photo transistor) Applications: Opto-isolators, Opto-encoders, Gyroscope (Acceleration sensor), Hall-effect sensors, Temperature sensor, Ultrasonic Sensor, Interfacing and Control of sensors

List of Practical:

1. Study of mechanical components.
2. Study of electrical and electronic components.
3. Visit and demonstration of Robot in campus.
4. Introduction to Arduino UNO kit- LED blinking.
5. LED array / Traffic Signals.
6. Push Button/Micro Switch.
7. Interfacing LDR with Arduino UNO.
8. Ultrasonic Sensor.
9. IR array
10. Temperature sensor.
11. 16x2 LCD
12. PMDC Motor
13. Servo Motor
14. Study of actuators.

List of Project Areas: A course project based on above contents.

Text Books:

1. R. K. Mittal, I. J. Nagrath, “Robotics and Control”, Tata McGraw Hill Publication.
2. R. K. Rajput, “Robotics and Industrial automation”, S. Chand Publications
3. D.P. Kothari, I.J. Nagrath, “Electrical Machines” , Tata McGraw Hill Publication.
4. S. R. Mujumdar, “Oil Hydraulic systems”, McGraw Hill Publications

5. John J. Craig, "Introduction to Robotics: Mechanics and Control", Prentice Hall, 2004

Reference Books:

1. T. Kenjo and S. Nagamori, "Permanent magnet and Brushless DC motors", Clarendon press, London, 1988.
2. Arduino Made Simple: With Interactive Projects.
3. Brock Craft, "Arduino Projects for Dummies", John Wiley & Sons Inc.
4. Serial Communication by: - Dr.Udit Satija, IIT Patna. Lecture 16: Embedded System- Serial.
5. Communication (Synchronous, Asynchronous, UART, CAN)-Part 1 and Lecture 17: Embedded System-Serial Communication (I2C, SPI, RS-232)-Part 2.
6. Richard D. Klafter, Thomas A. Chmielewski, Michel Negin, "Robotic Engineering: An Integrated Approach", Prentice Hall Publication.
7. Lawnthorn, Ray, "Electrical machines and actuators - Electric Motors for Robots: Mechanical Power",
8. David G. Alciatore, Michael B. Histand, "Introduction to Mechatronics and Measurement Systems",3rd Edition, Tata McGraw Hill Publication.

Course Outcomes:

The student will be able to -

1. Interpret various terminologies with reference to electromechanical systems such as robots.
2. Distinguish and analyse working mechanisms of different actuators in electromechanical systems.
3. Identify different end effectors and control
4. Understand application of electronic devices in digital and analog electronics
5. Illustrate the internal architecture and terminologies of microcontroller
6. Interface different sensors with microcontroller-based systems

FF No.: 654

PYTHON FOR ENGINEERS

Course Code: CS1018

Credits: 2 **Teaching Scheme: Theory: 1 Hours / Week**
Laboratory: 2 Hours / Week

Section I

Fundamentals of Python: Features of Python, How to Run Python code, Identifiers, Reserved Keywords, Variables, Comments in Python, Indentation in Python, Input, Output statements.

Operators: Arithmetic Operators, relational Operators, Logical Operators, bitwise operators, other stray operators, Operator Precedence, Mathematical Functions, Trigonometric Functions, Random Number Functions, Strings in python: subscript operator, indexing, slicing a string, string methods

Flow Control and Loops: Decision Making: if statement, if…else statement, if..elif ..else statement, Nested if statement; Loops : while loop , for loop, range() function, continue and break statement, while and for loop with else statement, pass statement.

Section II

In-built Data Structures in Python: List, Tuple, Set, Dictionary; Mutable and Immutable Objects, Data Type Conversion, Built-in methods and comprehensions.

Functions: Function Definition, Function Calling, Function Arguments, Anonymous Functions (Lambda Functions), recursive function, Function with more than one return value, default value to parameter, keyword parameter.

File Handling: Opening a File, Modes for Opening a File, Attributes of file object, closing a File, reading from a File, writing to a File, File Methods.

NumPy and Matplotlib: Introduction to NumPy, Arrays, Array indexing, comparison of Array and List data types, Array math, Broadcasting. Matplotlib -Plot, subplots and images.

List of Practical:

Assignments on Fundamentals of Python

1. Program to Calculate the Area of a circle and triangle
2. Program to Swap Two Variables
3. Program to Generate a Random Number
4. Program to Convert Kilometers to Miles
5. Program to find maximum of two numbers
6. Program to check if a number is even or odd
7. Program to check if a number is positive, negative or 0
8. A school decided to replace the desks in three classrooms. Each desk sits two students. Given the number of students in each class, print the smallest possible number of desks that can be purchased. The program should read three integers: the number of students in each of the three classes, a, b and c respectively. In the first test there are three groups. The first group has 20 students and thus needs 10 desks. The second group has 21 students, so they can get by with no fewer than 11 desks. 11 desks is also enough for the third group of 22 students. So we need 32 desks in total.
9. H hours, M minutes and S seconds are passed since the midnight ($0 \le H < 12$, $0 \le M < 60$, $0 \le S < 60$). Determine the angle (in degrees) of the hour hand on the clock face right now.
10. Given integer coordinates of three vertices of a rectangle whose sides are parallel to the coordinate axes, find the coordinates of the fourth vertex of the rectangle. In the first test the three given vertices are (1, 4), (1, 6), (7, 4). The fourth vertex is thus (7, 6).

11. There was a set of cards with numbers from 1 to N. One of the card is now lost. Determine the number on that lost card given the numbers for the remaining cards.
    Given a number N, followed by N − 1 integers - representing the numbers on the remaining cards (distinct integers in the range from 1 to N). Find and print the number on the lost card.

Assignments on Operators

12. Program to find maximum of three numbers
13. Program to check if a year is leap
14. Program to check if a date is valid
15. Program to find the roots of a quadratic equation
16. Given a string. Delete from it all the characters whose indices are divisible by 3.
17. Given a sequence of integer numbers ending with the number 0. Determine the length of the widest fragment where all the elements are equal to each other.
18. In bowling, the player starts with 10 pins at the far end of a lane. The object is to knock all the pins down. For this exercise, the number of pins and balls will vary. Given the number of pins N and then the number of balls K to be rolled, followed by K pairs of numbers (one for each ball rolled), determine which pins remain standing after all the balls have been rolled. The balls are numbered from 1 to N (inclusive) for this situation. The subsequent number pairs, one for each K represent the start to stop (inclusive) positions of the pins that were knocked down with each role. Print a sequence of N characters, where "I" represents a pin left standing and "." represents a pin knocked down.
19. A timestamp is three numbers: a number of hours, minutes and seconds. Given two timestamps, calculate how many seconds is between them. The moment of the first timestamp occurred before the moment of the second timestamp.

Assignments on Flow Control and Loops

20. Program to display first n numbers
21. Program to calculate factorial of a numbers
22. Program to display numbers in the reverse order
23. Program to check if a number is prime
24. Program to calculate sum and average of first n numbers
25. Program to display first n multiples of a number
26. Program to display first n Fibonacci numbers
27. Program to find the sum of digits of a number

Assignments on In-built Data Structures

28. Program to Create and view elements of a list
29. Program to Create and view elements of a tuple
30. Program to access List Index and Values
31. Program to add two Lists
32. Program to check if a List is Empty or Not
33. Program to Find the Largest Number in a List
34. Program to Find the Second Largest Number in a List
35. Program to Put Even and Odd elements in a List into Two Different Lists
36. Program to Find all Numbers in a Range which are Perfect Squares and Sum of all Digits in the Number is Less than 10
37. Program to Generate Random Numbers from 1 to 20 and Append Them to the List

38. Program to Remove the Duplicate Items from a List
39. Program to create and view a dictionary
40. Program to create and view elements of a set
41. Program to Print values of dictionary
42. Program to print all keys of dictionary
43. Program to insert and delete from dictionary
44. Program to sort (ascending and descending) a dictionary by value
45. Program to concatenate dictionaries to create a new one
46. Program to check whether a given key already exists in a dictionary.
47. Program to merge two Python dictionaries
48. Program to get the maximum and minimum value in a dictionary
49. Program to Add a list of elements to a set
50. Program to Update the first set with items that don't exist in the second set
51. Program to Return a set of elements present in Set A or B, but not both
52. Program to check if two sets have any elements in common.
53. Program to Remove items from set1 that are not common to both set1 and set2

Assignments on Functions

54. Function to check if a number is even or odd
55. Function to find the maximum of two numbers
56. Function with keyword arguments
57. Function with default arguments
58. Function to Find the Factorial of a Number Using Recursion
59. Function to Find the Sum of the Digits of the Number Recursively
60. Create a function named count vowels that accepts a string and returns the number of vowels in the string.
61. Write a function greet user that takes a user's name as a parameter and prints a personalized greeting message.
62. Given a sequence of integers that end with a 00. Print the sequence in reverse order. Don't use lists or other data structures. Use the force of recursion instead.

Assignments on File Handling

63. To keep record of students' data, manipulate files to store, update, and delete students' information.
64. Write a Python program that reads the content of a text file and prints it to the console.
65. Create a Python program that takes user input (a string) and writes it to a new text file.
66. Write a Python program that reads a text file, counts the number of words in it, and writes the word count to a new file.
67. Write a Python program that reads the content of one text file and writes it to another file.
68. Develop a Python program that counts the number of lines in a text file and displays the count.
69. Write a Python program that appends a user-provided string to the end of an existing text file.
70. To keep record of patients' medical data, manipulate files to store, update, and delete such information.
71. Write a python program to create two 3X3 random matrixes and perform following operation: (a) Addition (b) subtraction (c) multiplication and display shape, dimensions, dtype, Rank and flatten output of every o/p matrix.
72. Write a Python program to plot line chat, bar chart, pi chart, scatter chart, histogram for taking two

different arrays as input.

Link of YouTube lectures: Python for beginners

www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3

List of Projects Areas:

Students will be doing course projects in different areas of application of python programming such as web application, data analysis, computer vision, machine learning, artificial intelligence, web technologies, numerical analysis etc.

Text Books:

1. "Programming And Problem Solving With Python", Ashok Kamthane and Amit Ashok Kamthane , ISBN 9789387067578
2. "Beginning Programming with Python for Dummies", John Paul Mueller , Wiley Publishing, ISBN 9788126553488

Reference Books:

1. Dive into Python 3: Mark Pilgrim, Jesse Noller, Wiley Publishing, ISBN 9788184899115.
2. Python in Easy Steps, Tata McGraw Hill Education, ISBN 9789351343080
3. Learning Python, 5th Edition, Mark Lutz, O'Reilly, ISBN 978-1449355739

Moocs Links and additional reading material: www.nptelvideos.in, https://snakify.org/en/

Course Outcomes:

The student will be able to -

1. Understand Python programming basics.
2. Demonstrate mathematical and string manipulation functions in Python.
3. Apply core Python scripting elements such as flow control structures and loops.
4. Develop essential skills in python programming concepts like data structures and different built-in functions.
5. Apply a modular programming approach by making use of functions.
6. Demonstrate the ability to data frames, plots and files in different modes.

FF No.: 654

DATA ANALYSIS
Course Code: XX1017

Credits: 2	**Teaching Scheme: Theory: 1 Hour / Week** **Lab: 2 Hours / Week**

Section I

Introduction: Data, importance of data, Data Formats. Data applications in different fields, for taking informed decisions, Excel as a storage and data analysis tool.

Getting started with Excel: Workbooks and worksheets, formulas and Functions, Cell References, Range Names, sorting Data, querying Data, importing and exporting Data, Aggregation (sum, average etc) functions, lookup functions etc.

PivotTables: Creating, Manipulating the PivotTable, Properties, Setting Pivot table Options. Working with Charts: - Working with Excel Charts. Creating Charts with the Chart Wizard, Formatting Chart Objects, plotting Several Variables.

Section II

Statistics Basics: Mean, Median, Mode, Skewness, Normal Distribution, Standard Deviation, Variance, ANOVA, Probability Basics, Distributions, Hypothesis Testing, Derivatives, Partial Derivatives, Chain Rule, Vectors and Matrices, Matrix Operations, Linear Transformations.

Regression and Correlation: Simple Linear Regression, Regression Functions in Excel, Performing a Regression Analysis. Checking the Regression Model, Correlation, creating a Correlation Matrix, Outlier analysis, what is an Outlier, Box & whisker plots, Scatter plot

Power BI: Introduction to Power BI and its capabilities in data analysis. Power BI for analytics and data visualization enhancement. Hands-on sessions on Power BI feature ETL for data-driven insights

List of Practical (Any 10):

1) Familiarity with various sources of real-life databases and create dataset.
2) Assignment based on basic and conditional formatting.
3) Assignment based on text formatting and manipulation using various text functions and formulae and Power Query.
4) Assignment based on advanced lookup table functions.
5) Assignment based on data visualization using different types of charts, Pivot table & Pivot charts.
6) Assignment on curve fitting/Regression and Normal Distribution.
7) Extract Transform and load in Power BI.
8) AI Based : Survey Analysis on use of ChatGPT in various fields like healthcare, education, agriculture , marketing, finance ,etc.

Text Books:

1. Data Analysis with Excel, Manisha Nigam , bpb Publishers.
2. Introduction to Statistics and Data Analysis, Third Edition, Roxy Peck, Thomson/Brookes/Cole Publisher.

Reference Books:

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Published by John Wiley & Sons, Inc.

2. Introduction to Data Analysis Handbook, Migrant & Seasonal Head Start Technical Assistance Centre Academy for Educational Development Contract with DHHS/ACF/OHS/Migrant and Seasonal Program Branch.
3. Excel pivot tables: basic beginners' guide to learn excel pivot tables for data analysis and modelling, M. G. Martin
4. Microsoft Excel 2019 Data analysis and business modelling 6th edition, Wayne L Winston Microsoft website.

Course Outcomes:

The student will be able to -

1. Understand data and its importance in the data driven world
2. Use and apply basic and advance formulae of Excel to analyse data.
3. Process data using Pivot table functions
4. Plot different types of appropriate charts for data visualization
5. Understand basic statistical terminology and use statistical functions in excel
6. Students will understand the concept of AI assisted power BI

FF No.: 654

DIGITAL LOGIC DESIGN AND TESTING

Course Code: ET1017

Credits: 2	**Teaching Scheme: Theory: 1 Hours /Week** **Practical: 2 Hours/Week**

Section I

Introduction to Digital Systems, Number System and conversion techniques, Binary Arithmetic, Binary Codes, Logic Gates, study of Digital IC tester. Boolean Algebra, Logic Simplification, Basic Combinational Logic Circuit Design.

Section II

Arithmetic Circuits, Multiplexers and Demultiplexers, Encoders and Decoders, Concept of stuck at fault, stuck open, stuck short, stuck at 1 and stuck at 0, and Functionality test

List of Practical's and Project work:

1. Introduction to Digital Lab Tools (Digital Trainer Kit, Digital IC tester, Multisim etc.)
2. Implementation and testing of basic logic gates (Trainer Kit/Multisim)
3. Simplification of Boolean expressions and implementation using logic gates (trainer kit/Multisim)
4. Simplification of Boolean Expression using Karnaugh Map based on SOP and POS
5. Design and testing of combinational circuits (trainer kit/Multisim)
6. Design and testing of code converters (trainer kit/Multisim)
7. Design and testing of combinational circuits like half and full adders (trainer kit/Multisim)
8. Design and testing of multiplexers and demultiplexers (trainer kit/Multisim)
9. Design and testing encoders and decoders circuits on (trainer kit/Multisim)
10. Course Project Development and Demonstration

Text books:

1. R.P. Jain and K. Sarawadekar, Modern Digital Electronics, McGraw Hill
2. M. M. Mano and M. D. Ciletti, Digital Design, 5th ed. Upper Saddle River, NJ, USA: Pearson, 2013.
3. T. L. Floyd, Digital Fundamentals, 11th ed. Upper Saddle River, NJ, USA: Pearson, 2015.
4. M. M. Mano, Digital Logic and Computer Design. Englewood Cliffs, NJ, USA: Prentice-Hall, 1979.

Reference Books:

1. R. H. Katz and G. Borriello, Contemporary Logic Design, 2nd ed. Upper Saddle River, NJ, USA: Prentice Hall, 2005.
2. S. Brown and Z. Vranesic, Fundamentals of Digital Logic with VHDL Design, 3rd ed. New York, NY, USA: McGraw-Hill, 2009.
3. R. J. Tocci, N. S. Widmer, and G. L. Moss, Digital Systems: Principles and Applications, 11th ed. Upper Saddle River, NJ, USA: Pearson, 2010.
4. B. Holdsworth and C. Woods, Digital Logic Design. Amsterdam, Netherlands: Elsevier, 2002.

Course Outcomes:

The student will be able to –

1. Demonstrate the understanding of number systems and representation of a number in various number systems.
2. Apply knowledge of number systems and coding to perform binary arithmetic operations.
3. Analyze, simplify and verify Boolean expressions using Karnaugh maps and Boolean algebra techniques.
4. Implement and test basic combinational logic circuits.

FF No.: 654

ENGINEERING GRAPHICS

Course Code: ME1017

Credits: 2 **Teaching Scheme: Theory: 1 Hour /Week**
Laboratory: 2 Hours /Week

Section I

Unit 1: Fundamentals of Drawing Standard: Principles of Engineering Graphics and its Significance, Bureau of Indian Standards (BIS), dimensioning, lettering, type of lines, scaling conventions. First and Third Angle methods of projections.

Unit 2: Projections of Point, Lines & Planes: Projections of points, projections of lines, lines inclined to one reference plane, lines inclined to both reference planes. Projections of planes, inclination of the plane with HP and VP, True shape of a plane surface.

Unit 3: Orthographic projections – Introduction to orthographic projection, Orthographic projections of points lying in four quadrants drawing orthographic views of objects from their isometric views. Sectional orthographic projections – full section, half section, offset section.

Section II

Unit 4: Isometric Projection – Terminology, isometric scale, isometric view and isometric projection, isometric axes and lines, isometric views of simple solids

Unit 5: Projection of solids, Intersection and developments: Projections of solids, projections of cube, prisms, pyramids, cylinder, cone, tetrahedron, frustum of solids etc. Intersection of surfaces, intersection of solids & development of surfaces.

Unit 6: Curves used in Engineering Practice: Ellipse, Parabola, Hyperbola, normal and tangents to these curves, Involute, Cycloid, Epi-cycloid, Hypo-cycloid, Archimedean Spiral, Helix on cone and cylinder.

List of Practical: Any six (5 half imperial sheets from 2 to 8 and 9th on any CAD software)

1. BIS Types of dimensioning, lettering, type of lines, scale conventions. (Only Demonstration)
2. To draw : Ellipse, Parabola, Hyperbola, Involute, Cycloid, Epi-cycloid, Archimedean Spiral. (Any Two)
3. Orthographic views of by first angle method (Two component with one sectional view)
4. Draw projections of points and lines with different conditions in HP and VP. (Two Problems)
5. Draw Projections of solids and sectional views with respect to HP and VP. (Any Two components' solids)
6. Isometric views of parts integrated with different geometrical shapes. (Any Two components).
7. Draw the intersection geometry of solids. (Project work)
8. Development of surfaces for different geometries. (Any Two components)
9. Draw 2D/3D models of simple machine components using suitable software (Any one components)

Text books:

1. Bhatt N. D., Engineering drawing, Charotar publishing house, 2014
2. Shah P. J., Engineering Graphics, S. Chand and Company, 2013

Reference Books:

1. French, T.E. Vierck, C. J:, and Foster, R.J., Engineering Drawing, Tata–Mc Graw Hill, 2012.
2. Luzadder W.J., Fundamentals of Engineering Drawing – Prentice Hall India, 1993
3. Narayana K.L., Kannaiah.P., Engineering Drawing – Scitech Publications, Chennai, 2014.
4. Venugopal K., Engineering Drawing – New Age International, 2004
5. Natarajan K.V., A text book on Engineering Drawing – Classic prints, 2000
6. Gopalakrishna K.R., Engineering Drawing – Subash Stores, 2000

Course Outcomes:

The student will be able to –

1. Understand apply engineering drawing standards and practices
2. Understand and apply different types of curves for part design
3. Visualize and draw two dimensional views of the components
4. Understand location of points, lines and planes with respect to horizontal and vertical reference planes
5. Understand the intersection of solids and development of surfaces
6. Visualize and draw three dimensional parts from 2 dimensional views of planes and solids.

FF No.: 654

ELEMENTS OF CONSTRUCTION ENGINEERING
Course Code: CV1017

Credits:2	**Teaching Scheme: Theory: 1 Hour / Week** **Lab: 2 Hours/Week**

SECTION I

Introduction to Civil Engineering: Introduction to civil engineering, various disciplines of civil engineering, relevance of civil engineering in overall infrastructural development of the country, Introduction to types of buildings as per National Building Code, Components of residential building and their functions

Building Construction: Principles of planning, orientation of buildings, introduction to 'Byelaws' regarding building line, height of building, open space requirements, F.S.I., Setbacks, ventilation, sanitation. Numerical Examples on FSI.

Building Construction and Building Services: Type of building, Component of building and its functions, types of loads acting on building, types of brick bonds, typical building layout, Symbol used for water supply, plumbing, and sanitation. Types of building services like plumbing and sanitation, electricity, building finishes.

SECTION II

Building Construction Materials: Brick and cement block – properties and specifications Cement – OPC properties, grades and others types of cement and its uses. Cement mortar – constituents and preparations; Concrete – PCC and RCC; Steel – Uses of steel in building construction, types and market forms.

Foundation for Structures: Introduction to foundation, Types of foundation and their suitability, Soil type as foundation strata, Concept of bearing capacity, ultimate, safe and presumptive bearing capacity, Shallow foundation and Deep foundations, Modes of failure.

Introduction to AutoCAD

Introduction to CAD, Function keys AutoCAD basics, Cartesian coordinate system, draw commands, modify commands, Annotate Dimension Style Manager, Text command Layers blocks, Parametric, 2D Fundamentals, Drawing Area Setup Visual reference, 2D drawings, Introduction to 3D drawings. CAD drawings of small building plans and objects.

List of Practical

1. Site visit (On campus or off campus) to observe and understand different components of building/ infrastructure/environmental systems. [Submission: A report].
2. Case study on major fields of Civil Engineering – Presentation
3. Group discussion on any one topic related to building construction
4. Field test of Cement, Aggregates, Bricks.
5. Study of residential building drawing: Plan, Elevation and Section and writing NBC requirements for residential building.
6. Basic sheet of building drawing - types of lines, letters etc.
7. Drawing of Plan, elevation, and section for a residential building (only G.F with staircase)

Line Plan of residential building using AutoCAD

Project Areas: (Not limited to)

1. Introduction to Civil Engineering: Case studies of landmark civil engineering projects
2. Building Construction: Comparative analysis of different types of buildings
3. Infrastructure Projects: Analysis of construction challenges and solutions for complex infrastructure

projects.

4. Basic Construction Materials and Applications: Comparative study of traditional vs. smart materials in modern construction
5. Building Byelaws: Case study of a building design and how it adheres to local byelaws and regulations.
6. Drawing Standards and Conventions:Create a detailed drawing set for a residential or commercial building using standard conventions.
7. AUTOCAD: Develop a project that includes various CAD features such as layers, blocks, and annotations.

Text books:

1. Building Construction by B.C. Punmia, Laxmi Publications.
2. Building Materials by S.V. Deodhar, Khanna Publication.
3. Building Construction by Bindra and Arora, Dhanpat Rai Publications.
4. Civil Engineering Materials by Neil Jackson & Ravindra K. Dhir, Palgrave Macmillan.

Building Construction by Rinku Kumar and Sandeep Panchal, AICTE, New Delhi.

Reference Books:

1. Building Materials by S. K. Duggal, New Age International Publishers.
2. Civil Engineering Materials by TTTI Chandigrah, Tata McGraw Hill Publications.
3. Materials of construction by D.N Ghose, Tata McGraw Hill.
4. Building Construction by S.C. Rangwala, Charotdar Publications.
5. My Construction Practices by R. B. Chaphalkar, Sakal Publications.
6. National Building Code of India 2016.
7. IS:875 Part I -1987 - Code of practice for design loads (other than earthquake) for buildings and structures, Part 1- Dead loads — unit weights of building materials and stored materials.
8. IS:875 Part II-1987 - Code of practice for design loads (other than earthquake) for buildings and structures, Part 2- Imposed loads.
9. IS:875 Part III-2015 - Design loads (other than earthquake) for buildings and structures — code of practice, Part 3 - Wind loads.
10. IS 1893 Part I-2016 – Criteria for earthquake resistant design of structures.

Course Outcomes:

The student will be able to –

1. Define civil engineering, identify its major fields and their importance.
2. Apply building byelaws and planning regulations to ensure compliance in the design and construction of buildings and Draw line plan, Plan, elevation and section of residential/public building
3. Understand different building components, types of loads and types of building services
4. Identify and describe various building materials, applications, and compatibility in construction projects
5. Explain the types of foundation and understand the significance of bearing capacity on the design of foundation
6. Demonstrate basic AutoCAD commands and tools necessary for professional 2D drawing and draw line plan for residential/public building.

FF No.: 654

UNIVERSAL HUMAN VALUES

Course Code: HS1077

Credits: 2 **Teaching Scheme: Theory: 2 Hour s/ Week**

Section I

Universal human values - Need, Moving towards harmony

What is the Value education, need for the Value Education, moving towards value-based education from largely skill-biased education system. Understand the basic systems of a human society, i.e., Education-Sanskar, Health-Self regulation, Production-Work, Justice-Preservation, Exchange-Storage, Universal human values.

Human aspirations

Understand human aspirations, gain the skill for fulfilling the aspirations. Self-Exploration, Right understanding, difference between physical facility and the feeling of prosperity. Correct appraisal of Physical needs, meaning of Prosperity in detail.

Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body', the Body as an instrument of 'I', understanding the harmony of I with the Body.

Section II

Understanding Harmony in the Family

Feeling of Relationship as the Basis for Harmony in the Family. Understanding harmony in the Family. Understanding values in human-human relationship like: Trust, Respect, Affection, and Care. Guidance, Reverence, Glory, Gratitude, Love.

Understanding Harmony in the Nature and Existence as Co-existence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature. Nature as Collection of Units like (and not limited to): Physical order, Bio order, Animal order, Human order.

Understanding Harmony in the Society

The ultimate goal of humanity is harmony in the society at large. Acceptance of human values at the following four levels: Individual human being, As a member of a family, As a Responsible member of society, As a unit in nature/existence. Happiness at professional level, what are professional ethics/values? corelation of human values and professional values.

Text Books:

1. R S Naagarazan, "A text book on Professional Ethics and Human values", New age International.
2. R R Gaur, R Sangal, G.P. Bagaria, "A Foundation Course in Human Values and Professional Ethics", 1st Edition, Excel Book, 2009.

Reference Books:

1. Ivan Illich, "Energy & Equity", The Trinity Press, Worcester, and Harper Collins, USA, 1974.
2. P. L. Dhar, R.R. Gaur, "Science and Humanism", Commonwealth Publishers, 1990.
3. A N Tripathy, "Human Values", New Age International Publishers, 2003.
4. E G Seebauer & Robert L., "Berry Fundamentals of Ethics for Scientists & Engineers", Oxford University Press, 2000.
5. M Govindrajan, S Natrajan & V.S.Senthil Kumar, "Engineering Ethics (including Human

Values)", Eastern Economy Edition, Prentice Hall of India Ltd.
6. B P Banerjee, "Foundations of Ethics and Management", Excel Books, 2005.
7. https://uhv.org.in/uhv1notes, From AICTE.

Course Outcomes :

The student will able to

1. Understand concept of Universal value Education and see the need for developing a holistic perspective of life
2. Develop the clarity on the aspiration, what is my aspiration and how to fulfill my aspiration.
3. Understanding the Human being as Co-existence of Self and Body.
4. Feeling of Relationship as the basis for Harmony in the Family.
5. Understanding Harmony in the Nature and Existence.
6. Understand Harmony in the Society and professional ethics.

FF No.: 654

SCIENTIFIC RESEARCH METHODS 1

Course Code: XX1013

Credits: 1	**Teaching Scheme: Theory: 1 Hours / Week**

Section I

Fundamentals of Research (What is research?): Meaning of the terms Discovery, Research, Invention, Innovation, Novelty, Creativity and the difference between them with example. Videos of great inventions, Need for Research:- Socio-economic development, research impact on society and research impact on economy, explanation with one example for each, Examples of Engineering Research, Research Types Fundamental and applied with example and importance of both, Research Components: -Tools, techniques like Mathematical Modelling, Algorithms and domains in which it is used innovatively.

Literature Review: Finding and reviewing the literature, Sources of literature, identifying research gaps Identification of research problem, Types of research papers: Conference, Journals etc, Effective searching of literature, cross referencing, organizing the selected papers, Summary of literature review, framing of research problem statement and synopsis.

Publication Platforms: a) Conference: What is a conference? (International and National), Format of a conference, conference Theme, Invitation, selection process, keynote address, parallel sessions, oral and poster presentation, valedictory, selected papers for journals and explorer, conference proceedings **b) Research Journals:** What is a Research Journal? (International and National), Types of journals, Scopus, peer reviewed, refereed, Transactions and letters, various journal publishers like Elsevier, Springer, Taylor and Francis, ASME etc. Journal formats List of standard professional societies like IEEE, ASME, SAE etc

Section II

Research Paper: What is research a paper? Title and abstract, Introduction, Method, Evaluation, Conclusion, References, Writing a research paper-Style of writing and formatting, Processing and Displaying Data:-Charts –Various types of charts through ms-excel format, Types of charts, Error bars, trend line; Figures; Tables, PPT, Preparation of posters. Referencing: Writing reference to research paper; Use of referencing style and tool, typical format of references like Books, Book Chapters, Journal Articles, Conference Papers, Technical Reports and Internet Sources.

Journal Ratings and Evaluation (How to rate a Journal?): Meaning of impact factor and citation index like h-index. Who gives it and how gives it? Calculation of impact factor, Example for calculation of impact factor and h-index, Importance of publication house in selecting a journal, Process for journal paper review.

Intellectual property (IP): Introduction to IPR, Overview & Importance, Patents, their definition; Patent search, process of patent application; Copyrights, their definition; granting; searching & filing, Trademarks, role in commerce, importance, protection, registration; Case studies in IPR, charges for filing patents.

Research Ethics: Plagiarism, Authorship, use of language, Protecting confidentiality, Conflicts of interest, Research with humans and animals.

Text Books:

1. Karsnitz, O'Brien, Hutchinson, "Engineering Design an Introduction", 2nd Edition, Cengage Publication.
2. C.R. Kothari, "Research Methodology, Methods and Techniques", 2nd Edition, New Age International

Pvt. Ltd., Publishers, 2004.
3. R. Panneerselvam, "Research Methodology", Prentice Hall of India, New Delhi, 2004.
4. Vinayak Bairagi, Mousami V. Munot, "Research Methodology: A Practical and Scientific Approach", 1st Edition, CRC Press, 2019.

Reference Books:

1. W.M. Trochim, "Research Methods: the concise knowledge base", Atomic Dog Publishing, 2005
2. Arun Sharma, "How to Prepare for Logical Reasoning", McGraw Hill Publication.

MOOCs Links and additional reading material

1. https://nptel.ac.in/courses/121/106/121106007 (Introduction to Research by IIT Madras
2. https://nptel.ac.in/courses/109/106/109106137 (Intellectual Property by IIT Madras)
3. https://nptel.ac.in/courses/109/105/109105112 (Introduction on Intellectual Property to Engineers. By IIT Kharagpur)
4. https://nptel.ac.in/courses/110/106/110106141 (Entrepreneurship , by IIT Madras)
5. https://nptel.ac.in/courses/127/105/127105007 (Entrepreneurship Essentials, By IIT Kharagpur)
6. https://nptel.ac.in/courses/110/107/110107094 (Innovation, Business models and Entrepreneurship, by IIT Roorkee)
7. https://nptel.ac.in/courses/110/105/110105091 (Research Writing, by IIT Kharagpur)
8. https://nptel.ac.in/courses/109/105/109105115_#video (Qualitative Research methods and Research Writing, by IIT Kharagpur)
9. https://swayam.gov.in/nd1_noc20_hs66 /preview(Entrepreneurship and IP strategy, by IITKharagpur)

Course Outcomes :

The student will be able to

1. Understand the importance of doing research and its socio-economic impact.
2. Interpret and distinguish different fundamental terms related to research, discovery, invention, innovation etc.
3. Apply the methodology and tools of doing research and mode of its publication.
4. Write a research paper based on project work.
5. Understand intellectual property rights
6. Use the concepts of ethics in research.

FF No.: 654

APPLIED SCIENCE & ENGINEERING PROJECT-1

Course Code: XX1011

Credits: 2 **Teaching Scheme: Lab: 4 Hours / Week**

This course is Project Centric Learning providing hands on experience to students.
Here discussion, actual designing and implementations and review of project work will be done in ASEP- sessions.

Important parts of project:

Domain Areas- Awareness and identification of project areas like Agriculture, Defense, Healthcare, Smart city, Smart energy, Security Systems, Automobile, Space, Green Earth, Automobiles, Water Management, Swachh Bharat or any other socially relevant area.

Tools: Learn and use latest scientific/engineering tools such as Circuit Simulation (Pspice, Simulink, Workbench), Wired / Wireless and Ad-hoc Networking (NS-2 , Packet Tracer), Signal Processing (Code Composer Studio along with Integrated circuits) or any other scientific/engineering tools as per the project need.

Technology: Map the appropriate technology as per the selected project such as Artificial Intelligence, Block Chain, Robots, Cloud Computing, Energy Technology, Nanotechnology, Advanced Material, Clean Technology, Edge/Computing, New Screens along with Electronics, Energy harvesting, Energy storage, automobile, remote smart grid, biomedical, waste management, food processing or map any other relevant technology as per the project.

Activities

Step by step Implementation of activities by the students:

1. **Group Formation Activity: -** Project group formation within the allotted ASEP-1 Project batch, deciding Group leader and Assistant Group Leader.
2. **Brain Storming and Discussion Activity**: - Discussion on topics for ASEP -1 Project pertaining to Socially relevant areas. Discussion on Domain areas and identifying the domain area.
3. **Dissuasion** on the selected domain area and required Tools and Technology.
4. **Project Planning Activity: -** Discussion on Tools and Technology, Finalization of ASEP-1 Project topic considering appropriate Domain area, Tools & Technology in consultation with ASEP-1project Guide.
5. **Project Planning Activity: -** Finalization of Problem statement, objectives, methodology and systematic strategy to complete the ASEP-1 project in consultation with ASEP-1 Project guide.
6. **Synopsis Drafting Activity: -** Prepare Synopsis of the planned ASEP-1 project under the guidance of ASEP-1 Project guide and complete its online Registration.
7. **Team Work Activity**: - Report and update about project work progress regularly to ASEP-1 Project guide and timely complete the assigned tasks by him. Seek his advice guidance whenever required.
8. **Self-Learning Activity: -** Refer available online offline Resources, books, soft materials, consult with domain expertise in context with the project.
9. **Self Learning Activity: -** Learn the required tools, skill sets, acquire knowledge through relevant MOOCs for the project.
10. **Project Review 1, Mid Semester Assessment & Project Review 2**: **-** As part of in semester assessment of the ASEP-1 appear for the timely conducted project reviews by ASEP-1 guide to evaluate student progress.
11. **Project Prototype Designing Activity**: - Designing of project prototype based on domain areas by

incorporating appropriate tools and technology.

12. **Prototype Validation and Testing Activity**: - Validation and Testing Activity of the prototype and the obtained results to give the best possible solution.
13. **Project Report/Paper Writing Activity: -** Completion of the set objectives of project and to start writing report of the ASEP-1 Project in IEEE Research paper format.
14. **Project Report/Paper Writing Activity: -** Results and Discussions, writing the Interpretation of the obtained results of the accomplished ASEP-1 Project work in the report i.e. IEEE paper in systematic format and preparing the final PPT for final end sem assessment of the project.
15. **Final checking and Report/Paper Proof Reading Activity: -** of the IEEE project paper and PPT by ASEP-1 Project guide followed by its approval after doing the needful corrections.
16. **Online** submission of pdf of the IEEE Paper based of ASEP-1 Project for the record.
17. **End Semester Assessment: -** Present the IEEE Paper based of ASEP-1 Project and the PPT at Student ASEP-1 Project Conference on the scheduled date as part of End Semester Assessment of the ASEP-1 Project.
18. **Paper presentation on the project work Conference: -** Present the as prepared paper on the Project work at suitable National/International Conference.
19. **Journal Publication: -** Publish the quality project work in a peer reviewed and International/ National Research journal with repute indexed in Web of Science/Scopus/UGC CARE).
20. **Patent/ Innovation: -** If the project work done has novelty, innovation and future commercial aspects then file a Patent on it.

Text Books:

1. K Nagrajan , "Project Management", 2nd Edition, New age International Ltd., 2004.
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3. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning.

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2. A. Whimbey and J. Lochhead, "Problem Solving & Comprehension", 6th Edition, Lawrence Erlbaum, Mahwah, NJ, 1999.
3. M. Levine, "Effective Problem Solving", 2nd Edition, Prentice Hall, Upper Saddle River, NJ, 1994.
4. John. R. Karsnitz, Stephen O"Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) 2nd Edition, 2013.

Course Outcomes:

The student will be able to –

1. Identify projects relevant societal needs.
2. Map technologies and learn the tools as per the project needs.
3. Apply the technological knowledge to design various feasible solutions.
4. Select best possible solution to solve the problem.
5. Develop/fabricate a working model of the proposed solution.
6. Testing and validate product performance.

FF No.: 654

REASONING AND APTITUDE DEVELOPMENT 1

Course Code: HS1072

Credits:1 **Teaching Scheme: Tutorial: 1 Hour / Week**

English Language

Familiarity with English Language, Ability to understand written text, spoken word and effective communication through written documents; Coverage of vocabulary to cope up with general and specific terminology, syntax and sentence structure, prevention of incorrect use leading to distortion in communication; synonyms, antonyms and contextual vocabulary, Grammar – Error identification, sentence improvement and construction, Reading Comprehension

Logical Ability

Objective interpretation of things, ability to perceive and interpret trends to make generalizations; ability to analyze assumptions behind an argument or statement; Deductive reasoning: Assessment of ability to synthesize information and derive conclusions - Coding deduction logic, Data Sufficiency, Directional Sense, Logical word sequence, Objective reasoning, Selection and decision tables, puzzles; Inductive reasoning: Assessment of ability to learn by example, imitation or by trial – Analogy pattern recognition, Classification pattern recognition, Coding pattern recognition, Number series pattern recognition; Abductive reasoning: Critical thinking ability of seeing through logical weak links or loopholes in an argument or a group of statements; Critical reasoning: assessment of ability to think through and analyze logical arguments, assessment of ability to use logical constructs to offer reasoning in unfamiliar situations; Information Gathering and synthesis: Ability of locating information, information ordering, rule based selection and data interpretation, order and classify data, interpret graphs, charts, tables and make rule based deductions. Application of these approaches for using visual, numerical and textual data from single or multiple sources

Quantitative Ability

Basic numbers – decimals and fractions, factorization, divisibility: HCF, LCM, Odd, even, prime and rational numbers. Application of algebra to real world, direct and inverse proportion, common applications – Speed-time -distance, Profit-loss, percentage, age relations, mixtures, other miscellaneous quantitative combination, exponentials and logarithms, permutations and combinations, probability. Spatial reasoning: Inductive – Missing portions, Sequence and series; Deductive analysis.

Reference Books:

1. "English Grammar in Use" by Raymond Murphy, Cambridge University Press.
2. "Word Power Made Easy" by Norman Lewis, Goyal Publishers & Distributors.
3. "Objective General English" by S.P. Bakshi, Arihant Publications.
4. "English for Competitive Examinations" by K. Sinha, S. Chand Publishing.
5. "Essential English Grammar" by Philip Gucker, Wiley.
6. "English Idioms and Phrasal Verbs" by M.A. Yadav, Vikas Publishing House.
7. "The Oxford English Grammar" by Sidney Greenbaum, Oxford University Press.
8. "A Modern Approach to Verbal & Non-Verbal Reasoning" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121903409.
9. "Logical Reasoning and Data Interpretation for the CAT" by Nishit K. Sinha, Pearson India, ISBN: 978-8131709117.

10. "Logical Reasoning and Data Interpretation for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
11. "A New Approach to Reasoning Verbal and Non-Verbal" by B.S. Sijwali & Indu Sijwali, Arihant Publications, ISBN: 978-9311124692.
12. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121900637.
13. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
14. "The Pearson Guide to Quantitative Aptitude for Competitive Examination" by Pearson, Pearson India, ISBN: 978-8131709117.
15. "Quantitative Aptitude for Competitive Examinations" by Abhijit Guha, Tata McGraw Hill Education, ISBN: 978-0070666653.
16. "Data Interpretation & Data Sufficiency" by R.S. Aggarwal, S. Chand Publishing ISBN: 978-8121903515.
17. "Quantitative Aptitude for Competitive Examinations" by S. Chand, S. Chand Publishing, ISBN: 978-8121903423.

Course Outcomes

The student will be able to –

1. Improve the reading, writing and verbal skills, and enhance comprehension and articulation abilities
2. Develop logical reasoning abilities, enabling them to make sound decisions in problem-solving scenarios
3. Develop mathematical aptitude as well as data interpretation abilities and use them in test cases and real world problems
4. Learn to apply approaches for optimum time-management, prioritization maximizing the accuracy
5. Learn data interpretation, apply mathematical skills to draw accurate conclusions
6. Apply their knowledge of english, reasoning and quantitative skills for planning, critical thinking and real world problems

FF No.: 654

GENERAL PROFICIENCY – 1

Course Code: HS1074

Credits: 1 **Teaching Scheme: Lab - 2 Hours / Week**

List of Practical:

1. Know Yourself: Self Introduction - Personal Information, achievements, family background
2. Self-Evaluation for Career Planning: Short term, Long term goals. Setting SMART goals, process of performing SWOT Analysis
3. Interpersonal Skill Development: Positive Relationship, Positive Attitudes, Handling Situations
4. Professional etiquettes: meaning and significance, organizational ethics, Telephonic etiquettes, table manners, professional etiquettes, hygiene and clothing manners.
5. Communication skills: Meaning and types, barriers in communication, Importance of non-verbal communication.
   Public speaking: do's and don'ts in public speech, Effective use of gestures through a product presentation.
6. Writing Skills: Application writing, email, BLOG writing, article writing

Text books:

1. Barun K. Mitra, 'Personality Development and Soft Skills, Oxford, ISBN: 9780199459742
2. Gopalaswamy Ramesh, 'The Ace of Soft Skills: Attitude, Communication and Etiquette for Success', Pearson, ISBN · 9789332515789
3. Soma Mahesh Kumar, 'Soft Skills', McGraw Hill, ISBN: 9789355325259
4. Uma Maheshwari, 'J/W ExamXpert Soft Skills for Campus Placements', Wiley, ISBN-10. 8126575379, ISBN-13. 978-8126575374

Reference Books:

1. Gopalaswamy Ramesh, Mahadevan Ramesh, 'The ACE of Soft Skills: Attitude, Communication and Etiquette for Success', Pearson India, ISBN: 9789332515789.
2. Sharon Gerson, Steven Gerson, "Technical writing process and product", Pearson Education Asia, LPE 3rd edition.
3. Gajendra Singh Chauhan, Sangeeta Sharma, 'Soft Skills: An Integrated Approach to Maximise Personality', Wiley, ISBN: 9788126556397.
4. B.N. Ghosh, 'Managing Soft Skills for Personality Development', McGraw Hill, ISBN (13): 978-0-07-107813-9. ISBN (10): 0-07-107813-4.

Course Outcomes:

The student will be able to –

1. Understand importance of soft skills in professional and personal life.
2. Exercise swot analysis and define his / her goals for career.
3. Develop interpersonal skills.
4. Demonstrate professional etiquettes in a workplace.
5. Apply appropriate communication skills to be an effective communicator.
6. Write precise briefs or reports and technical documents.

FF No.: 654

STUDENT ACTIVITY

Course Code: HS1083

Credits: 1 **Teaching Scheme: Lab: 2 Hours / Week**

Contents

Orientation sessions on topics of social relevance by eminent experts.

Students are expected to plan, execute and actively participate in any one or more pre-determined social activities (under the supervision of faculty and members of team Student Council - Social Welfare and Development Committee) for a minimum duration of 30 hours during a semester. These activities will be carried out at various locations jointly with Non-Government Organizations, Semi-Govt. authorities, Govt. authorities, Social Forums, Foundations, etc.

Student is expected to prepare and submit a report under the supervision of course faculty (in annexed format) on Vishwakarma Online Learning Platform.

List of Project areas includes:

1. Cleanliness drives at pre-defined places
2. Street Plays for social, economic awareness of citizens (drugs, corruption, election awareness, cleanliness, Women safety etc.)
3. Tree Plantation, New and Renewable Energy usage awareness, Sustainable development goals,
4. Digital Literacy: Impart training regarding use of digital media for bill payments, online banking, Ticket booking, social media handling, mailing, etc.
5. Teach for India: Training of school students in rural areas, government schools
6. Rain harvesting related activities
7. Awareness of Various Govt. schemes for benefit of citizens, Senior citizen schemes, farmer schemes,
8. Women empowerment
9. Contribution towards plastic free environment
10. Skill India: Training for skills development to unemployed youth.
11. Awareness regarding plan of action during natural and man-made disasters.
12. Assistance to various domains to grow in their profession (Professions like Teachers, Shopkeepers, Farmers, etc.)
13. Development of Engineering projects for social cause.

Book:

Krishna Kant Singh, Ram Shankar Singh, "An Introduction to Social Work", 1st Edition, Penguin Books Ltd, 2010.

Course Outcomes:

The student will be able to

1. Enhance awareness and commitment towards active citizenship and social responsibility
2. Examine and articulate personal social identities, privileges, and biases.
3. Define personal role as a engineer and citizen in both local and global communities.
4. Recognize the importance of and actively seek contributions from others regardless of differing social identities.
5. Appropriately challenge the unfair, unjust, or uncivil behaviour of other individuals or groups.
6. Develop positive attitude towards under-privileged sections of the society
7. Correspond professionally with others (e.g. Peers/team members, agents, campus offices, cosponsoring groups, etc.) To organize logistics related to specific programs or events.

FF No.: 654

INDUCTION TRAINING

Course Code: HS1027

Credits: Audit	**Teaching Scheme: Lab: 2 Hours/Week**
Section I	
➢ Physical activity ➢ Creative Arts ➢ Universal Human Values ➢ Literary	
Section II	
➢ Proficiency Modules ➢ Lectures by Eminent People ➢ Familiarization to Departments & Institute	
References:	
Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.	
Course Outcomes:	
The student will be able to 1. Inculcate the ethics and culture of institution. 2. Explore their academic interests and activities reducing competition. 3. Develop awareness about the institute's culture in students. 4. Promote bonding within themselves. 5. Build relations between faculty members and students.	

FF No.: 654

SCIENTIFIC RESEARCH METHODS 2

Course Code: XX1015

Credits: 1 **Teaching Scheme: Theory: 1 Hour / Week**

Section I

Structure of Research Paper

Title, Abstract, Keywords, Introduction (Literature review), Methodology, Design/ Testing, Results and Discussions, Conclusions, Acknowledgements, References. Figure, Equations, Tables etc formatting and editing.

Journal List (Top 50 Journals) Journal rankings (https://www.scimagojr.com/journalrank.php), Find identify and short list the Top 50 research journals in respective engineering branch. Understand the quality, quantity, extent and most importantly the novelty of research work is required to publish into such reputed Journals.

Selection of the Publication Platform (Conference Journal, Book Chapter)

Journal Quartile, Indexing, impact factor, Journal Types open access, Scopus indexed, Web of Science indexed Journals (SCI and SCIE) indexed journals

Use of various online journal selection tools

Springer (https://journalsuggester.springer.com/) Elsevier (https://journalfinder.elsevier.com/) Web of Science (https://mjl.clarivate.com/home)–Manuscript Matcher (It can be used after creating free account).

Plagiarism checking

Use of various online free plagiarism checker tools as well as licensed software tools like iThenticate (https://www.ithenticate.com/).

Section II

Plagiarism Fixing and Content Improvement

Based on the Plagiarism reports the manuscript draft can be refined and modified in order to make it not only unique but also technically and grammatically correct.

Patent search

Indian patent journal (https://ipindia.gov.in/journal.htm), Google Patent Search (https://patents.google.com/), International Patents, (https://patentscope.wipo.int/search/en/search.jsf) USA patent (https://www.uspto.gov/patents/search)

Patent drafting and Filing: Understand the forms, documentations and steps and the official procedure involved in the process of Patent drafting and filing

Entrepreneurship: Introduction to Entrepreneurship, Meaning and concept of entrepreneurship, The Entrepreneur, Meaning of entrepreneur, the skills required to be an entrepreneur, the entrepreneurial decision process, Business Opportunity Identification: Business ideas, methods of generating ideas, and opportunity recognition, Preparing a Business Plan: Meaning and significance of a business plan, components of a business plan, and feasibility study, Financing the New Venture: Importance of new venture financing

Text Books:

1. Karsnitz, O'Brien, Hutchinson, "Engineering Design an Introduction", 2nd Edition, Cengage Publication.
2. Laurie Rozakis, "Schum's quick guide to Write Great Research Papers", 2nd Edition, McGraw-Hill.
3. Chris A. Mack, "How to write a good Scientific Paper", SPIE PRESS Bellingham, Washington USA,

2018.
4. The Office of Controller General of Patents, Designs and Trademarks, "Manual Of Patent Office Practice and Procedure", version 3.0, Mumbai, India (2019).

Reference Books:

1. Anthony C. Winkler and Jo Ray Metherell, "Writing the Research Paper A Handbook", 8th Edition, Wadsworth, Cengage Learning, Boston USA, 2011.
2. World Intellectual Property Organization,"WIPO Patent Drafting Manual", 2nd Edition, Geneva, Switzerland (2022).

MOOCs Links and additional reading material

1. https://nptel.ac.in/courses/110/105/110105091 (Research Writing, by IIT Kharagpur)
2. https://archive.nptel.ac.in/courses/127/105/109105115 (Qualitative Research Methods And Research Writing, by IIT Kharagpur)
3. https://archive.nptel.ac.in/courses/109/106/109106128 (Patent Drafting for Beginners, By IIT Madras)

Course Outcomes:

The student will be able to

1. Understand the structure of a research paper.
2. Identify key research journals in different engineering areas and understand the importance of quality, extent and novelty in research papers.
3. Apply various online tools to select appropriate research journals based on different parameters.
4. Check plagiarism in the manuscript by using online plagiarism detection platforms and amend and improve its content accordingly.
5. Search different patent (Indian/international) databases by using online patent search platforms.
6. Understand the process of patent drafting and filing.
   Understand the entrepreneurship and business planning

FF No.: 654

APPLIED SCIENCE & ENGINEERING PROJECT-2

Course Code: XX1014

Credits: 2	**Teaching Scheme: Lab: 4 Hours / Week**

This course is Project Centric Learning providing hands on experience to students.

Here discussion, actual designing and implementations and review of project work will be done in ASEP-2 sessions.

Important parts of project:

Domain Areas- Awareness and identification of project areas like Agriculture, Défense, Healthcare, Smart city, Smart energy, Security Systems, Automobile, Space, Green Earth, Automobiles, Water Management, Swachh Bharat or any other socially relevant area.

Tools: Learn and use latest scientific/engineering tools such as Circuit Simulation (Pspice, Simulink, Workbench), Wired / Wireless and Ad-hoc Networking (NS-2 , Packet Tracer), Signal Processing (Code Composer Studio along with Integrated circuits) or any other scientific/engineering tools as per the project need.

Technology: Map the appropriate technology as per the selected project such as Artificial Intelligence, Block Chain, Robots, Cloud Computing, Energy Technology, Nanotechnology, Advanced Material, Clean Technology, Edge/Computing, New Screens along with Electronics, Energy harvesting, Energy storage, automobile, remote smart grid, biomedical, waste management, food processing or map any other relevant technology as per the project.

Activities

Step by step Implementation of activities by the students:

1. **Group Formation Activity: -** Project group formation within the allotted ASEP-2 Project batch, deciding Group leader and Assistant Group Leader.
2. **Brain Storming and Discussion Activity**: - Discussion on topics for ASEP -2 Project pertaining to socially relevant areas. Discussion on Domain areas and identifying the domain area.
3. **Dissuasion** on the selected domain area and required Tools and Technology.
4. **Project Planning Activity: -** Discussion on Tools and Technology, Finalization of ASEP-2 Project topic considering appropriate Domain area, Tools & Technology in consultation with ASEP-2 project Guide.
5. **Project Planning Activity: -** Finalization of Problem statement, objectives, methodology and systematic strategy to complete the ASEP-2 project in consultation with ASEP-2 Project guide.
6. **Synopsis Drafting Activity: -** Prepare Synopsis of the planned ASEP-2 project under the guidance of ASEP-2 Project guide and complete its online Registration.
7. **Team Work Activity**: - Report and update about project work progress regularly to ASEP-2 Project guide and timely complete the assigned tasks by him. Seek his advice guidance whenever required.
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9. **Self-Learning Activity: -** Learn the required tools, skill sets, acquire knowledge through relevant MOOCs for the project.
10. **Project Review 1, Mid Semester Assessment & Project Review 2**: **-** As part of in semester assessment of the ASEP-2 appear for the timely conducted project reviews by ASEP-2 guide to evaluate student progress.

11. **Project Prototype Designing Activity**: - Designing of project prototype based on domain areas by incorporating appropriate tools and technology.
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18. **Paper presentation on the project work Conference: -** Present the as prepared paper on the Project work at suitable National/International Conference.
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Reference Books:

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4. John. R. Karsnitz, Stephen O"Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) 2nd Edition, 2013.

Course Outcomes:

The student will be able to –

1. Identify projects relevant societal needs.
2. Map the technologies and learn the tools as per the project needs.
3. Apply the technological knowledge to design various feasible solutions.
4. Select best possible solution to solve the problem.
5. Develop/fabricate a working model of the proposed solution.
6. Testing and validate product performance.

FF No.: 654

REASONING AND APTITUDE DEVELOPMENT 2

Course Code: HS1079

Credits:1 **Teaching Scheme: Tutorial: 1 Hour / Week**

English Language

Familiarity with English Language, Ability to understand written text, spoken word and effective communication through written documents; Coverage of vocabulary to cope up with general and specific terminology, syntax and sentence structure, prevention of incorrect use leading to distortion in communication; synonyms, antonyms and contextual vocabulary, Grammar – Error identification, sentence improvement and construction, Reading Comprehension

Logical Ability

Objective interpretation of things, ability to perceive and interpret trends to make generalizations; ability to analyze assumptions behind an argument or statement; Deductive reasoning: Assessment of ability to synthesize information and derive conclusions - Coding deduction logic, Data Sufficiency, Directional Sense, Logical word sequence, Objective reasoning, Selection and decision tables, puzzles; Inductive reasoning: Assessment of ability to learn by example, imitation or by trial – Analogy pattern recognition, Classification pattern recognition, Coding pattern recognition, Number series pattern recognition; Abductive reasoning: Critical thinking ability of seeing through logical weak links or loopholes in an argument or a group of statements; Critical reasoning: assessment of ability to think through and analyze logical arguments, assessment of ability to use logical constructs to offer reasoning in unfamiliar situations; Information Gathering and synthesis: Ability of locating information, information ordering, rule based selection and data interpretation, order and classify data, interpret graphs, charts, tables and make rule based deductions. Application of these approaches for using visual, numerical and textual data from single or multiple sources

Quantitative Ability

Basic numbers – decimals and fractions, factorization, divisibility: HCF, LCM, Odd, even, prime and rational numbers. Application of algebra to real world, direct and inverse proportion, common applications – Speed-time -distance, Profit-loss, percentage, age relations, mixtures, other miscellaneous quantitative combination, exponentials and logarithms, permutations and combinations, probability. Spatial reasoning: Inductive – Missing portions, Sequence and series; Deductive analysis.

Reference Books:

1. "English Grammar in Use" by Raymond Murphy, Cambridge University Press.
2. "Word Power Made Easy" by Norman Lewis, Goyal Publishers & Distributors.
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4. "English for Competitive Examinations" by K. Sinha, S. Chand Publishing.
5. "Essential English Grammar" by Philip Gucker, Wiley.
6. "English Idioms and Phrasal Verbs" by M.A. Yadav, Vikas Publishing House.
7. "The Oxford English Grammar" by Sidney Greenbaum, Oxford University Press.
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11. "A New Approach to Reasoning Verbal and Non-Verbal" by B.S. Sijwali & Indu Sijwali, Arihant Publications, ISBN: 978-9311124692.
12. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal, S. Chand Publishing, ISBN: 978-8121900637.
13. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma, McGraw Hill Education, ISBN: 978-0070709642.
14. "The Pearson Guide to Quantitative Aptitude for Competitive Examination" by Pearson, Pearson India, ISBN: 978-8131709117.
15. "Quantitative Aptitude for Competitive Examinations" by Abhijit Guha, Tata McGraw Hill Education, ISBN: 978-0070666653.
16. "Data Interpretation & Data Sufficiency" by R.S. Aggarwal, S. Chand Publishing ISBN: 978-8121903515.
17. "Quantitative Aptitude for Competitive Examinations" by S. Chand, S. Chand Publishing, ISBN: 978-8121903423.

Course Outcomes

The student will be able to –

1. Improve the reading, writing and verbal skills, and enhance comprehension and articulation abilities.
2. Develop logical reasoning abilities, enabling them to make sound decisions in problem-solving scenarios.
3. Develop mathematical aptitude as well as data interpretation abilities and use them in test cases and real world problems.
4. Learn to apply approaches for optimum time-management, prioritization maximizing the accuracy.
5. Learn data interpretation, apply mathematical skills to draw accurate conclusions.
6. Apply their knowledge of english, reasoning and quantitative skills for planning, critical thinking and real world problems.

FF No.: 654

GENERAL PROFICIENCY– 2

Course Code: HS1080

Credits: 1	**Teaching Scheme: Lab - 2 Hours / Week**

List of Practical:

1. Listening skills: Process of listening, Types, Barriers in listening, Tips for being a good listener
2. Team building: process of team building, significance and methods to develop team spirit
3. Body Language: Effective use of body language in professional world
4. Time Management: Use of Time Management tools
5. Group Discussion: Techniques and rules and regulations during GD, Do's and don'ts in GD.
6. Job Interviews: preparation, demonstration

Text books:

1. Barun K. Mitra, 'Personality Development and Soft Skills, Oxford, ISBN: 9780199459742
2. Gopalaswamy Ramesh, 'The Ace of Soft Skills: Attitude, Communication and Etiquette for Success', Pearson, ISBN · 9789332515789
3. Soma Mahesh Kumar, 'Soft Skills', McGraw Hill, ISBN: 9789355325259
4. Uma Maheshwari, 'J/W ExamXpert Soft Skills for Campus Placements', Wiley, ISBN-10. 8126575379, ISBN-13. 978-8126575374

Reference Books:

1. Gopalaswamy Ramesh, Mahadevan Ramesh, 'The ACE of Soft Skills: Attitude, Communication and Etiquette for Success', Pearson India, ISBN: 9789332515789.
2. Sharon Gerson, Steven Gerson, "Technical writing process and product", Pearson Education Asia, LPE 3rd edition.
3. Gajendra Singh Chauhan, Sangeeta Sharma, 'Soft Skills: An Integrated Approach to Maximise Personality', Wiley, ISBN: 9788126556397.
4. B.N. Ghosh, 'Managing Soft Skills for Personality Development', McGraw Hill, ISBN (13): 978-0-07-107813-9. ISBN (10): 0-07-107813-4.

Course Outcomes :

The student will be able to –

1. Understand importance of listening skills.
2. Exercise team building.
3. Demonstrate effective use of body language.
4. Implement time management tools.
5. Participate in group discussion and evaluate the same.
6. Develop interview skills.

FF No.: 654

ENVIRONMENTAL STUDIES

Course Code: HS1082

Credits: 1 **Teaching Scheme: Theory: 1 Hours / Week**

Module 1: Introduction to Environmental Studies & Sustainability

Multidisciplinary nature, scope and importance of environmental studies, Concept of sustainability and Sustainable Development Goals (SDGs), Environmental Social Governance (ESG): Need and applications, Green finance and introduction to environmental economics, Environmental ethics: Need for ecological responsibility, Human population and urbanization: Impact on environment and health

Module 2: Pollution, Waste Management & Ecosystems

Types of pollution: Air, water, soil, noise – causes, effects, control measures, Nuclear and industrial pollution – human health risks, Solid waste management (intro only): Case studies: CNG in Delhi, plastic ban, e-waste issues, Ecosystems: Structure, components, energy flow, food chains/webs, Types of ecosystems: Forest, desert, grassland, aquatic, Ecological succession and environmental resilience

Module 3: Biodiversity and Natural Resources

Levels of biodiversity: Genetic, species, ecosystem, Biogeographic zones of India; biodiversity hotspots, Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching, invasive species, Conservation strategies: In-situ and ex-situ, Natural Resources: Renewable & non-renewable, Land degradation, deforestation, water scarcity, energy needs, Water conflicts: Inter-state (e.g., Cauvery), global context, Case studies: Silent Valley, Narmada project, solar village in Gujarat

Module 4: Environmental Policies, Laws, and Public Engagement

Indian environmental laws: Environment Protection Act (1986), Air Act (1981), Water Act (1974), Wildlife Protection Act (1972), Forest Conservation Act (1980), Global protocols: Montreal Protocol, Kyoto Protocol, CBD, Disaster management: Floods, earthquakes, cyclones, landslides, Resettlement and rehabilitation (R&R) case examples, Public awareness & community movements, Chipko Movement, Bishnoi practices, Silent Valley, Role of media and education in sustainability, National Climate Action Plan (NCAP) and India's environmental vision

Text Books:

. G. Pyler Miller, Cott E. Spool man, “Environmental Sciences”, 16th Edition, Cengage Publications.

2. E. Bharucha, “Textbook of Environmental Studies for Undergraduate Courses”,2ndEd., UGC Publication.

3. Mackenzie L. Davis and David A. Cornwell, “Introduction to Environmental Engineering”, 4th Edition, Tata McGraw-Hill Education Private Limited New Delhi, 2010.

4. J. Tyler Jr. Miller and Spoolman, “Environmental Science with Mindtap”, 14th Edition, Cengage Learning, 2014.

Reference Books:

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Delhi, 2007.
2. J. Glynn Henry and Gary W. Heinke, “Environmental Science and Engineering”, 2nd Edition, Pearson Education (Singapore) Pte. Ltd, 2004.

E-resources: (MOOCs Links and additional reading material):

https://epathshala.nic.in

https://vikaspedia.in

https://sdgs.un.org/goals

https://indiabiodiversity.org

Course Outcomes:

The student will be able to –

1. Understand the interdisciplinary nature, scope, and importance of environmental studies.
2. Identify major types of pollution, biodiversity loss, and resource degradation.
3. Demonstrate understanding of environmental policies, sustainability principles, and global agreements
4. Recognize the role of human behavior, ethics, and community engagement in environmental protection.

FF No.: 654

INDIAN DEMOCRACY AND CONSTITUTION

Course Code: HS1036

Credits: Audit

Section I

Democracy in India: a) Indian parliamentary democracy b) Lok Sabha c) Rajya Sabha

Important concepts of Indian Democracy - a) Fundamental rights in Indian constitution b) Fundamental duties in Indian constitution c) Challenges of national integrity

Good Governance a) Meaning and concepts of good governance b) Government and governance c) Good governance from directives principles of state policy

Section II

Introduction to Constitution - Meaning and importance of the Constitution, salient features of Indian Constitution. Fundamental Duties Content. History of the Indian Constitution. Constitution and Constitutionalism.

Preamble to the Indian Constitution - Philosophy of the Fundamental Rights. Different important Articles from the Indian Constitution.

Directive Principles of State Policy - An Introduction to Directive Principles of State Policy. Fundamental Duties in the Indian Constitution.

Text Books:

1. M.V.Pylee, "Introduction to the Constitution of India", 4th Edition, Vikas publication, 2005.
2. M P Jain, " Indian Constitutional Law", 8th Edition , Justice Jasti Chelameswar.

Reference Books:

1. Durga Das Basu, "Introduction to the Constitution of India", Gurgaon; LexisNexis, 23rd Edition, 2018.
2. Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition, Meraga publication, 2007.

Course Outcomes:

The student will be able to –

1. Analyze the democratic framework with the help of its standards of governance.
2. Critically examine election process in the country.
3. Enhance their understanding of good governance.
4. Analyze the indian political system, the powers and functions of the union, state and local governments in detail.