Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Structure & Syllabus of

Department of Engineering, Sciences & Humanities (DESH)

Pattern 'A-22'

F. Y. B. Tech.

Effective from Academic Year 2022-23

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

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

Contents

Program Outcomes

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Academic Information – Pleasevisitwww.vit.edu

Module 1 - Semester 1						
Course Code	**Course Name**	**Teaching Learning Scheme**				
		Th	**Tut**	**Lab**	**Hrs. / Week**	**Credits**
Module I (M1) Courses – Semester 1						
ES1034	Problem Solving and Programming	3	1	2	6	5
ES1035	Robot: Mechanics and Electronics	2	1	2	5	4
ES1043	Mathematics and Statistics	3	1	0	4	4
ES1044	Product Design and Development	2	0	2	4	3
HS1033	Human Engineering	2	0	0	2	2
ES1041	Design Thinking 1	0	1	0	1	1
ES1025	Engineering Design and Innovation I	0	0	8	8	4
HS1037	General Proficiency	0	0	2	2	1
HS1027	Induction Training	0	0	2	2	0
ES1014	Environmental Science	2	0	0	2	0
		14	**4**	**18**	**36**	**24**

Module 2 - Semester 1						
Course Code	**Course Name**	**Teaching Learning Scheme**				
		Th	**Tut**	**Lab**	**Hrs. / Week**	**Credits**
Module II (M2) Courses – Semester 1						
ES1034	Problem Solving and Programming	3	1	2	6	5
ES1035	Robot: Mechanics and Electronics	2	1	2	5	4
ES1043	Mathematics and Statistics	3	1	0	4	4
ES1045	Computer Organization and Architecture	2	0	0	2	2
ES1031	Cognitive Aptitude	3	0	0	3	3
ES1041	Design Thinking 1	0	1	0	1	1
ES1025	Engineering Design and Innovation I	0	0	8	8	4
ES1037	Mobile Application Development	0	0	2	2	1
HS1027	Induction Training	0	0	2	2	0
ES1014	Environmental Science	2	0	0	2	0
		15	**4**	**16**	**34**	**24**

Module 2 - Semester 2						
Course Code	**Course Name**	**Teaching Learning Scheme**				
		Th	**Tut**	**Lab**	**Hrs. / Week**	**Credits**
Module II (M2) Courses – Semester 2						
ES1039	Mechatronics and Robotics	3	1	2	6	5
ES1046	Data Structures	3	0	2	5	4
ES1030	Discrete Mathematics	3	1	0	3	4
ES1045	Computer Organization and Architecture	2	0	0	2	2
ES1031	Cognitive Aptitude	3	0	0	3	3
ES1042	Design Thinking 2	0	1	0	1	1
ES1026	Engineering Design and Innovation II	0	0	8	8	4
ES1037	Mobile Application Development	0	0	2	2	1
HS1036	Indian Democracy and Constitution	0	0	2	2	0
HS1038	Professional Development	0	0	2	2	0
		14	**3**	**18**	**34**	**24**

Module 1 - Semester 2						
Course Code	**Course Name**	**Teaching Learning Scheme**				
		Th	**Tut**	**Lab**	**Hrs. / Week**	**Credits**
Module I (M1) Courses – Semester 2						
ES1039	Mechatronics and Robotics	3	1	2	6	5
ES1046	Data Structures	3	0	2	5	4
ES1030	Discrete Mathematics	3	1	0	3	4
ES1044	Product Design and Development	2	0	2	4	3
HS1033	Human Engineering	2	0	0	2	2
ES1042	Design Thinking 2	0	1	0	1	1
ES1026	Engineering Design and Innovation II	0	0	8	8	4
HS1037	General Proficiency	0	0	2	2	1
HS1036	Indian Democracy and Constitution	0	0	2	2	0
HS1038	Professional Development	0	0	2	2	0
		13	**3**	**20**	**36**	**24**

Course Name: PROBLEM SOLVING AND PROGRAMMING

Course Code: ES1034

Credits: 5	**Teaching Scheme: Theory: 3 Hours / Week** **Tutorial: 1 Hour / Week** **Lab: 2 Hours / Week**

Section I

Computing Fundamentals: Introduction to numbering systems: Decimal, Binary, Hexadecimal, Octal. Introduction to computing jargons: Nibble, Bit, Byte, Word, double word, KB, MB, GB etc.

Overview: Introduction to C programming, Introduction to Compiler, Interpreter, Loader, linker, debugger. Indentations and comments, data types, variables, Constants: language Reserved words, data types and modifiers, Identifier naming rules, variable declaration, variable storage, character constants – character set, escape sequence, string constants, Integer constant, float and double constants

Control Statements: if statement, if-else statement, if-else-if ladder, compound and nested if statement, switch case statement, Loop Statements: while, do while and for loops, continue statement, break statement.

Operators and Expressions: Operators: Arithmetic operator, relational operator, logical operators, bitwise operators, stray operators, operator precedence & associatively.

Arrays: Array Basic, Array Types, Array Declaration, initialization of array, Array Accessing, Contiguous Memory, Applications illustrating use of arrays to store ordered and unordered sequences, Multidimensional Array, Initializing and accessing multidimensional array. Representation of array in memory

Strings: Strings Basics, Strings Declaration, Strings Initialization, NULL terminated string, reading and printing strings, string library functions

Section II

Functions: Function purpose, function declaration, definition and calling, function parameters and return type and value, passing array to function, introduction to call by value vs call by reference, Local and global variables. Recursive function – how, when, advantages and limitations.

Pointers in C: pointer basic concept, pointer variable – declaration and initialization, pointer & and *operators, why pointer to different data types are different? void pointer, pointer memory organization, pointer operations, pass by value Vs pass by reference

Array and pointers: array name and pointer, how [] operator operates on array name, passing array to a function, Dynamic memory allocation.

Structures, Union and Bit fields: Introduction to structure, unions and bit field: their usage and applications.

Introduction to files: file handling, create, read, write and append.

List of Tutorials:

All tutorials must be focusing on development of a logic, flowchart, algorithm and pseudo code for the given problem statement.

1. Generate the Fibonacci series of elements.
2. Round off an integer to the next largest multiple of another integer.
3. Interchange the contents of two variables without using third variable.
4. Calculate the average of given numbers
5. Write a logic to find whether the given point (x, y) lies inside the circle with radius r, on the circle or outside the circle.
6. To calculate the monthly interest of customers fixed deposit.
7. To calculate the sum of series given as 1, ½!, 1/3!, ¼!,…..... 1/n!
8. Test the given number as prime number
9. Test whether the given number is Armstrong number
10. Convert the binary to decimal and decimal to Binary number
11. Write the logic to print the factorial of a number
12. Reverse the given string and separate the alphabets of string.
13. Find the smallest and largest numbers from given N numbers.
14. Calculate whether the given number is divisible by 3/5/7 etc.
15. Multiplication of two matrices
16. Calculate the surface area and volume of a cylinder
17. Addition of two matrices and algorithm for use of functional pointer
18. Exchange a string from one variable to another using pointers.
19. Check whether the odd size given matrix is magic square or not
20. Enumeration of all subset, permutation, etc

List of Practical:

1. Assignment based on different operators and expressions in C.
2. Assignment based Control Statements and Looping Statements in C.
3. Assignment based on 1 D Array.
4. Assignment Based on Multidimensional array.
5. Assignment based on Strings.
6. Assignment Based on Functions in C.
7. Assignment based on Recursion.
8. Assignment based on Pointers in C.
9. Assignment based on Array pointers.
10. Assignment based on Double Pointers in C.
11. Assignment based on Structure, Union and Bit field
12. Assignment based on File handling in C

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. To solve the problems of rotational motion, Heat transfer problems etc
6. Database/File Handling Application.
7. Game development using C
8. Algorithms in computational geometry(eg. convex-hull, closest pair of points)
9. Desktop GUIs.
10. Solving statistical problems

Text Books:

1. Herbert Schildt E. Horwitz, "C: The Complete reference", TMH Publication
2. Yashwant Kanetkar, "Let Us C", BPB Publication.

Reference Books:

1. Harry. H. Chaudhary, **"**C Programming :The Definitive Beginner's Reference" , First MIT-CreateSpace Inc. O-D, Publishing, LLC USA .
2. R. G. Dromey, " How to solve it by Computer" Prentice Hall, ISBN 978-0134340012
3. Brian Kernighan and Dennis Ritchie, "The C programming Language" PHI; 2nd edition , ISBN-10 : 0131103628

Moocs Links and additional reading material:www.nptelvideos.in

Course Outcomes:

The student will be able to:

1. understand use of numbering system for computer programming and contrast storage of different data types in computer memory.
2. analyze and convert a given problem statement into a program using operators and flow control statements.
3. Organize constants of identical data types into an array and use it for applications like searching and sorting.
4. justify modular programming approach by making use of functions
5. appraise the power of pointers to get insight into memory management and to improve efficiency of code.
6. arrange and store data using data structures and file handling

Course Name: ROBOT: MECHANICS AND ELECTRONICS

Course Code: ES1035

Credits: 4	**Teaching Scheme: Theory: 2 Hours / Week** **Tutorial: 1 Hour / Week** **Lab: 2 Hours / Week**

Section I

Robot Terminology: History and future of Robotics, Basics of Robotics, Anatomy and specification of a Robot, Classification and configurations of robots, Mechanical, Electrical and Electronics Components used in Robotics, Degree of Freedom, Robot coordinates, Roll-Pitch-Yaw, terms like accuracy, precision, resolution, repeatability etc. Robot software interface, Robot analogy with human body.

Robot Kinematics: Kinematic linkages, reference frames, Forward and Inverse kinematics, D-H matrix, numerical examples.

Actuators: Pneumatic, Hydraulic, Electrical – Solenoid coil, Construction, working principle of PMDC, BLDC, Stepper and Servo motors, Merits and Demerits, Applications and selection of actuators.

Section II

Semiconductor Devices: Diodes, Rectifiers, Zener Diode, LED, photo diode, opto-isolators, BJT (as switch, amplifier, and multi vibrator), FET, MOSFET, IGBT, op-amp

Digital Electronics: Logic gates, Basic gates using transistor, Flip-flops, counters, registers, ADC, DAC**.**

Tutorials:

1) Force, Torque, Equilibrium, Free body diagrams, friction, centre of gravity, centre of mass, centroid and moment

2) Practice sessions on Mechanics, Electrical Motor,

3) Practice sessions on Basic Electronics and Logic gates

4) Week 4 to 7 – Presentation by student

5) Week 8 to 10 – Course Project Presentation

List of Practical:

1) Study of Mechanical components

2) Study of Basic Electrical and Electronic components

3) Circuit – 1, 4) Circuit – 2, 5) Circuit – 3

6) LEGO Kit – 1, 7) LEGO Kit – 2, 8) LEGO Kit – 3, 9) LEGO Kit – 4, 10) LEGO Kit – 5

11) LEGO Kit – 6

Or 8-11) Course Project

12) Lab. exam. and /or viva.

- All the Lab. submissions and assignments should be in hard copy format to reduce the tendency of copying.

Text Books:

1. R. K. Mittal, I. J. Nagrath, Robotics and Control, Tata McGraw Hill Publication
2. David G. Alciatore, Michael B. Histand, Introduction to Mechatronics and Measurement Systems , 3 rd Edition, Tata McGraw Hill Publication.
3. Ferdinand P. Beer, E. Russell Johnston,Mechanics of Materials.
4. P. S. Bimbhra, Power electronics,Khanna Publishers,
5. S.B.Dewan, G.R.Slemon&A.Stranghan, Power Semi conductor controlled Drives, John Willey Pub.
6. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, New Delhi, 2000.
7. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.

Reference Books :

1. John J. Craig, Introduction to robotics: Mechanics and Control, Prentice Hall, 2004.
2. Richard D. Klafter, Thomas A. Chmielewski, Michel Negin, Robotic Engineering: An Integrated Approach, Prentice Hall Publication.
3. Lawnthorn, Ray,Electrical machines and actuators - Electric Motors for Robots : Mechanical Power, Kindle Edition

Course Outcomes:

The student will be able to –

1. understand importance of Robotics and the terminology w.r.t. different mechanical, electrical and electronics components and their applications in Robotics..
2. understand the significance and make basic calculations based on Robot Mechanics.
3. understand the working principle and working of different actuators used in Robotics.
4. understand the concept, significance and make basic calculations based on Robot Kinematics.
5. understand use of different electronic and power devices in circuits related to Robotics.
6. understand use of different digital components and devices in circuits related to Robotics.

Course Name: MATHEMATICS AND STATISTICS

Course Code: ES1043

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

Section I

Vector Spaces: Rank of matrix, Elementary Matrices, System of linear equations.

Euclidean Vector space, Vector Space, Subspace, Span of a set, Spanning Set, Fundamental Subspaces, Linear Dependence, Independence, Basis and dimension of a vector space

Linear Transformation: Definition, Kernel, Range, Matrix of Linear Transformation, One-one, Onto transformation, Geometric transformations in R^2 and R^3.

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a matrix, Diagonalization, Symmetric Matrices, Orthogonal Matrix, Orthogonal Diagonalization

Section II

Functions of two or more variables: Introduction to functions of two or more variables, limits and continuity (only introduction), Partial derivatives, chain rules, maxima and minima of functions of two variables.

Higher order Linear Differential equations: First order linear ode, Second order ODEs and its applications: Homogeneous Linear ODE's, Non homogeneous ODE's.

Statistics: Descriptive Statistics: Data types, Data presentation, Data Distribution, Measures of central tendency, Data shapes, Data visualization

Random Variable: random variable-Discrete and continuous, probability mass function, probability density functions, expectation and variance of distribution, covariance and correlation coefficient.

Text Books:

1. Ron Larson and David C. Falvo, ' Linear Algebra :An Introduction',1st Edition, Cengage Learning (Indian Edition).
2. Ron Larson and Bruce H. Edwards, 'Text book of Calculus', Brooke/Cole, a part of Cengage Learning (Indian Edition), (c) 2011.
3. Erwin Kreyszig, 'Advanced Engineering Mathematics'10th Edition, Dec. 2010, , John Wiley and sons, Inc.

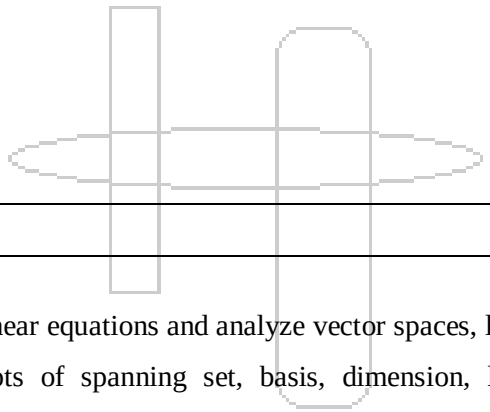
Reference Books:

1. David C. Lay, 'Linear Algebra and its Applications', 3rd Edition, Pearson.
2. Jim DeFranza and Daniel Gagliardi, 'Introduction to Linear Algebra with Applications', Tata McGraw-Hill Edition.
3. Gilbert Strang, 'Linear Algebra and its Applications', 4th Edition, Cengage Learning.
4. B.V. Ramana, 'Higher Engineering Mathematics' Tata McGraw-Hill publishing co. Ltd.
5. Michael D. Greenberg; Advanced Engineering Mathematics; Pearson Education Asia

6. Peter V. O'Neil; Advanced Engineering Mathematics; 5th edition, Thomson Brooks/Cole.

List of Tutorials:

1. Rank of matrix, Elementary Matrices, System of linear equations, Gauss-Jordan Elimination. Applications of System of Linear equations.
2. Vector space, Subspace, Span of a set, Spanning Set, Fundamental Subspaces,
3. Linear Dependence, Independence, Basis and dimension
4. Linear Transformation, Matrix representation, Eigen Values and Eigen Vectors and properties
5. Diagonalization, Symmetric Matrices and Orthogonal Diagonalization
6. Functions of several variables, domain and range, standard quadric surfaces and evaluation of partial derivatives
7. Chain rules for partial derivatives
8. maxima and minima of functions of two variables
9. Second order ODEs and its applications: Homogeneous Linear ODE's
10. Non homogeneous ODE's, Euler Cauchy Equation.
11. Descriptive Statistics
12. Random Variables



Course Outcomes:

The student will be able to –

1. solve the system of linear equations and analyze vector spaces, linear transformation.
2. recognize the concepts of spanning set, basis, dimension, linear dependence/independence, matrix of linear transformation
3. find eigen values and eigen vectors
4. demonstrate the knowledge of partial derivatives and its applications
5. solve linear differential equations and interpret the solution
6. represent, visualize and analyze statistical data

Course Name: PRODUCT DESIGN AND DEVELOPMENT

Course Code: ES1044

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

Section I

1. **Creative Problem Solving Process and Tools -** Introduction to Creative Engineering Problem Solving across Disciplines / Branches - TRIZ, 8D, and other Creative thinking tools etc.
2. **Product Lifecycle Management :** Creative Product Design, development, Manufacturing, and Life-cycle Management Process. Reverse Engineering Software Product Life Cycle Management
3. **Human Centric UI-UX Design :** Introduction to Aesthetics, and Human factors in Engineering Design - Ergonomics, UI- UX for Software Apps, Interface / HMI / HCI design for Controls in Engineering Products / Electronic gadgets, Industrial equipments, etc. Differently-abled Users, Usability studies

Section II

4. **Design Thinking & DFX:** Design Thinking, Development Stages-TRL, MRL, IRL aspects, Concepts of Quality & Reliability in product design & Development, House of Quality, Quality Function Deployment (QFD), Failure Modes & Effects Analysis (FMEA), Types of FMEA, Robust Design, Case studies Other DFX areas from various fields (IT, Instru., Elex, etc.)
5. **Introduction to Product Visualisation and Communication:** Tools and Techniques - Sketching, Drawing, Data Visualization, Standardization, Drafting, Wireframe design of Software Apps / Industrial Products, Prototyping
6. **Product Viability & Cost Analysis:** Practical aspects like Industrial Organization, Management and Economics related to New Product Development. Sustainable /Green aspects of Product Development. Case studies**.**

List of Practical:

1. Reverse Engineering of a simple machine / Toy / gadget / PC.
2. Real life Creative Engg. problem solving - Using TRIZ / other techniques
3. Case studies based on Interdisciplinary product development & PLM.
4. Design and Develop a web or mobile app or an industrial control panel / HMI making use of the effective UI , UX , Human Centric Design principles
5. Experiments on various manufacturing tools / processes for hands-on experience.
6. Lab.-Experiment based on DFX / QFD - Quality Function Deployment / FMEA-Failure Modes and Effects Analysis
7. Lab.-Experiment based on Assignment based on Design Visualization and communication using Tools like Tableau, Canva, Autodesk Sketchbook, etc.
8. Product Development Project management, Team work planning and costing on the

course project using modern techniques like Agile and SCRUM.

9. Case study on Software Product Design
10. Case study product Design for differently-abled users
11. Methods of Prototypes & Utility
12. User Surveys for Product Performance Improvement
13. Product Costing analysis for a physical/ Software/ service Product
14. Value Engineering analysis of a physical / Software/ service Product

Text Books:

1. Ulrich, Karl T., Eppinger, Steve D., and Yang, Maria C., Product Design and Development. 7th ed., McGraw-Hill Education, 2020.
2. Kevin N. Otto, Kristin L. Wood · Product design: techniques in reverse engineering and new product development, 2001, Prentice Hall
3. Anil Mital & et al, Product development: a structured approach to consumer product development, design, and manufacture, 2008.
4. Liu, Carl, Innovative Product Design Practice, 2015
5. Chitale A K & Gupta R C , Product Design and Manufacturing ,PHI

Reference Books:

1. Industrial Designers Society of America, Design Secrets: Products: 50 Real-Life Product Design Projects, 2001.
2. Beno Benhabib, Manufacturing: Design, Production, Automation, and Integration (Manufacturing Engineering and Materials Processing), 2003
3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, Bloomsbury Publishing India

Moocs Links and additional reading material:

https://www.pdd-resources.net/resources.html

Course Outcomes:

The student will be able to

1. have a 360° understanding of the role of an engineer in society.
2. apply the understanding of Product life cycle phases & their Characteristics.
3. interpret & apply the Human & user centric aspects of Design and UI-UX.
4. understand the contemporary principles of design thinking, DFX etc
5. apply the techniques of Visualization and Modeling.
6. understand and apply sustainability aspect of product design and development .

Course Name: DESIGN THINKING 1

Course Code: ES1041

Credits: 1	**Teaching Scheme: Tutorial: 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, and Research Components:-Tools, techniques and algorithms and domains in which it is used innovatively Identification of research problem:- Finding and reviewing the literature, Sources of literature, Types of research papers: Conference, Journals etc, framing of research problem statement and synopsis.

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.

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

Literature Review

Meaning, Effective searching of literature, cross referencing, identifying research gaps, organizing the selected papers, Summary of literature review

Section II

Research Paper Writing

Structure of research 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

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. C.R. Kothari , Research Methodology, Methods and Techniques ,2nd Edition, New Age International Pvt. Ltd., Publishers (2004)
2. R. Panneerselvam, Research Methodology, Prentice Hall Of India, New Delhi,2004
3. 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 IIT Kharagpur)

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 (IPR).
6. use the concepts of Ethics in Research.
7. understand the Entrepreneurship and Business planning

Course Name: ENGINEERING DESIGN AND INNOVATION - I

Course Code: ES1025

Credits: 4 **Teaching Scheme: Theory: 8 Hours / Week**

Activities

This course is Project Centric Learning providing hands on experience to students. Theoretical inputs / information will be provided through Design Thinking 1 Sessions while actual designing and implementations of project work is done through EDI-1.

Step by step Implementation of activities by the students:

1. **Group Formation Activity: -** Project group formation within the allotted EDI-1 Project batch, deciding Group leader and Assistant Group Leader
2. **Brain Storming and Discussion Activity**: - Discussion on topics for EDI-1 Project pertaining to Socially relevant areas as discussed in the subject Design Thinking 1 (DT1). Discussion on Domain areas and identifying the domain area
3. **Dissuasion** on the selected domain area and required Tools and Technology also discussed in the subject Design Thinking 1 (DT1) for the project
4. **Project Planning Activity:-** Discussion on Tools and Technology, Finalization of EDI-1 Project topic considering appropriate Domain area, Tools & Technology in consultation with EDI-1 project Guide
5. **Project Planning Activity:-** Finalization of Problem statement, objectives, methodology and systematic strategy to complete the EDI-1 project in consultation with EDI-1 Project guide
6. **Synopsis Drafting Activity:-** Prepare Synopsis of the planned EDI-1 project under the guidance of EDI-1 Project guide and complete its online Registration
7. **Team Work Activity**:- Report and update about project work progress regularly to EDI-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 Capstone Project appear for the timely conducted project reviews by EDI-1 Project 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. **PrototypeValidation 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 EDI-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 EDI-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 EDI-1 Project guide followed by its approval after doing the needful corrections.
16. **Online** submission of pdf of the IEEE Paper based of EDI-1 Project for the record
17. **End Semester Assessment:-** Present the IEEE Paper based of EDI-1 Project and the PPT at Student EDI-1 Project Conference on the scheduled date as part of End Semester Assessment of the EDI-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)
2. PradeepPai, Project Management, 1st Edition, PEARSON INDIA (2019)
3. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second

Reference Books:

1. H. S. Fogler and S. E. LeBlanc, "Strategies for Creative Problem Solving", 2nd edition, Pearson,Upper Saddle River, NJ, 2008.
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) Second Edition, 2013.

Course Outcomes :

The student will be able to –

1. identify projects relevant societal needs
2. map the technologies learned with 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

Course Name: MECHATRONICS AND ROBOTICS

Course Code: ES1039

Credits: 5	**Teaching Scheme: Theory: 3 Hours / Week** **Tutorial: 1 Hour / Week** **Lab: 2 Hours / Week**

Section I

Sensors: Proximity sensor (Range sensor), Tactile sensor (Contact sensor), Current sensor, Tilt sensors, Light sensor, Gyroscope, Encoders, Hall effect sensors, Temperature sensor, Acceleration sensor, Image sensor, Camera etc.

Microcontrollers :

Microcontroller, ATmega, architecture, peripherals, ports, registers, timer, counter, serial communications, ADC, interrupts etc.

Microcontroller programming & interfacing : Embedded C Programming, Port configuration - for Signal in and Signal out configuration and programming, Interfacing of relay, stepper motor, LCD display, keyboard etc.

Section II

Actuators and Control: Interfacing of Relay, Solenoid, programming for control, motor driver and speed control – PWM**.**

Serial Communication Systems: Introduction to Serial communication w.r.t. ATMega328P – RS232, I2C, SPI, WiFi, Blue Tooth.

Industrial Robotics and Applications: Introduction to different systems in Industrial Robotics, Automation, PLC, Basics of Ladder programming, Ladder logic, basic instructions, Introduction to SCADA.

Tutorials:

1. PPT sessions on different topics allotted to groups
2. One topic per group per round
3. Week 1 to 5 – Round 1
4. Week 6 to 10 – Round 2

List of Practical:

Interfacing of following components with Arduino Uno.

1) LED with Arduino 2) LDR 3) Push Button / Micro Switch 4) Ultrasonic Sensor

5) IR array 6) Temperature sensor 7) 16x2 LCD 8) 7 Segment Display

9) Bluetooth module 10) PMDC Motor 11) Servo Motor 12) Lab. exam. and/ or viva.

Text Books:

1. R. K. Mittal, I. J. Nagrath, Robotics and Control, Tata McGraw Hill Publication
2. Muhammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems using Assembly and C,

2nd edition, Pearson

3. Kenneth Ayala ,The 8051 Microcontroller (with CD) , Cengage Learning
4. – Fu, Lee ,Robotics – Control, Sensing, Vision and Intelligence, TataMcGraw Hill
5. Vijay Singh ,Fundamentals of Programmable Logic Controllers, New Age International (P) Ltd.
6. Hackworth, Programmable Logic Controllers Programming Methods And Applications with CD, Pearson India.
7. George Kennedy and Bernard Davis, S R M Prasanna,Kennedy's Electronic Communication System (SIE), McGraw Hill Education.
8. Arduino Made Simple: With Interactive Projects
9. Brock Craft ,Arduino Projects for Dummies, John Wiley & Sons Inc.
10. Serial Communication by :-Dr.UditSatija, IIT Patna.Lecture 16 : Embedded System- Serial Communication (Synchronous, Asynchronous, UART, CAN)-Part 1 and Lecture 17 : Embedded System-Serial Communication (I2C, SPI, RS-232)-Part 2.

Reference Books:

1. John J. Craig ,Introduction to Robotics: Mechanics and Control, Prentice Hall, 2004.
2. Richard D. Klafter, Robotic Engineering: An Integrated Approach, Thomas A. Chmielewski, Michel Negin, Prentice Hall Publication.
3. Lawnthorn, Ray, Electrical machines and actuators - Electric Motors for Robots : Mechanical Power, Kindle Edition

Course Outcomes:

The student will be able to –

1. identify different sensors, understand their significance related to Robotics and select a sensor as per the requirement.
2. understand the internal configuration and architecture of microcontroller.
3. interface different sensors and peripherals to a microcontroller and program the same.
4. interface different display devices, actuators and control them using a program.
5. Use different communication protocols to control a robot.
6. understand significance of different systems used in Robotics and Automation.

Course Name: DISCRETE MATHEMATICS

Course Code: ES1030

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

Section I

Sets, Functions and Relations: Operations on sets, Cardinality, Finite and infinite sets, Relations, and their properties, N-ary relations and their applications, Representing relations, Equivalence relations, Partitions, Partial order relation, Posets, Hasse diagrams, Lattices, Chain, Antichains, Types of functions, sequence, summation, Countable and uncountable sets.

Basic Counting Principles: Permutations and combinations, Binomial coefficients and identities, Principles of inclusion and exclusion and its applications. Mathematical Induction, Pigeonhole principle, Elementary applications to discrete probability.

Number Theory: Divisibility, GCD/LCM, The Euclidean algorithm, Prime numbers, Integers, Fundamental theorem of arithmetic, Remainder theorem, Modular arithmetic, Solving congruence's, Arithmetic with a prime modulus, Arithmetic with an arbitrary modulus, Euler's Phi function, Euler's theorem, Fermat's Little theorem, Applications in cryptography

Section II

Recurrence relations:

Infinite Series: Introduction to Sequence, Limit of sequence, Convergence, Introduction to infinite series, Sequence of partial sums, convergence, Geometric series and p- series, Test of convergence: Ratio test and Comparison test.

Linear recurrence relations with constant coefficients(homogeneous case); Linear recurrence relations with constant coefficients (non-homogeneous case); homogeneous and particular solutions. Solution of linear recurrence relations using generating functions. Applications to linear systems.

Graph Theory: Definition, types of graph, directed, undirected, directed acyclic, and bipartite graphs, Connected components, Eulerian graphs, Hamiltonian cycles, Incidence matrices, Adjacency matrix, relationship between the matrices. Graph coloring , Planar graphs, dual graphs, Cut edge, cut vertex, edge connectivity, vertex connectivity.

Introduction to Trees, Spanning tree, rooted tree Application of Trees, Spanning Trees, Minimum Spanning Trees.

List of Tutorials:

1. Sets, Functions and Relations , Properties of relations and functions
2. Equivalence relations, Posets, Hasse diagrams, Lattices
3. Permutations and combinations,
4. Principles of inclusion and exclusion and its applications, Pigeonhole principle
5. Divisibility, GCD/LCM, the Euclidean algorithm and Modular arithmetic

6. Solving congruences
7. Euler's Phi function Euler's theorem, Fermat's Little theorem, Applications in cryptography
8. Examples on various types of graphs
9. Examples on tress
10. Applications of graph theory

Text Books:

1. Kenneth H Rosen: Discrete Mathematics and its Applications, McGraw Hill (2012).
2. Richard Johnsonbaugh: Discrete Mathematics, Eighth Edition, Pearson.

Reference Books:

1. C. Liu, D. Mohapatra[CM]. Elements of Discrete Mathematics. 2008. Tata McGraw-Hill
2. H. Van Lint, R. M. Wilson: A Course in Combinatorics ,Cambridge University Press.
3. J. P. Tremblay, R. Manohar:Discrete Mathematical Structures with Applications to Computer Science, 1 st Edition ,Tata McFraw-Hill
4. D.B.West, Introduction to Graph theory, Prentice hall of India, 1998.

Course Outcomes:

The student will be able to –

1. understand and evaluate sets, relations, functions, number system.
2. identify and use operations on sets, relations, functions, combinatorial identities, advanced counting techniques.
3. analyze and interpret the concepts of divisibility, prime number, modulo arithmetic, congruence and number theorems.
4. construct and solve recurrence relations.
5. understand and apply terminology of graph theory, types of graphs, matrices associated with graphs, trees.
6. translate a physical problem into a mathematical model, find solution of the model by selecting and applying suitable mathematical method

Course Name: DATA STRUCTURES

Course Code: ES1046

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

Section I

Unit 1: INTRODUCTION TO DATA STRUCTURES

Array, Functions, Call by Value and Call by Reference, Recursion, structure, pointers, pointer to pointer, Pointer to array, array of pointers, pointers to function.

(Revision of these topics, as it is already covered in PSAP)

Introduction to Data Structures: Concept of data, Data object, Data structure, Abstract Data Types. Concept of primitive and non-primitive, linear and Non-linear, static and dynamic, persistent and ephemeral data structures.

Unit 2: STACKS

Concept of stack, stack as ADT, Implementation of stack, Concept of implicit and explicit stack, Applications of stack-(Matching Parenthesis Problem, Expression Conversion-infix to prefix, infix to postfix, postfix expression evaluation)

Unit 3: QUEUES

Concept of queues as ADT, Implementation of queue, Concept of circular queue, double ended queue, and priority queue. Applications of queues.

Section II

Unit 4: LINKED LISTS

sequential Vs linked memory organization, singly linked list, linked implementation of stack and queue, doubly linked list, circular linked list, ordered linked list, Linked list as an ADT. Representation of polynomials using linked lists.

Unit 5: SEARCHING AND SORTING TEHNIQUES

Need of searching and sorting, Concept of internal and external sorting, sort stability. Searching methods: Linear and binary search algorithms their comparison. Sorting methods: Bubble, selection, insertion, merge, quick, bucket sort, Radix Sort.

Unit 6 : ANALYSIS OF ALGORITHMS

Analysis of algorithm: frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm, Big 'O', ‘Ω' and 'Θ' notations, Best, Worst and Average case analysis of an algorithm Applications of data structures, Introduction to Trees and Graphs

List of Practical:

1. C program to push (), pop (), display (), peek (), stack full () and stack empty () operations on stack using array.

2. C Program to convert Infix to postfix expression Using Stack.
3. C program to convert Prefix to postfix expression Using Stack.
4. C program to implement Linear queue using array and perform the following operations a)Insert b)delete c)peek d)queue full() e)queue empty()
5. C program to implement Circular queue using array and perform the following operations a) Insert b) delete c) display rear d) display front d) queue full() e)queue empty()
6. C program to implement Doubly ended queue using array and perform the following operations a) Insert front b) Insert rear c) delete rear d) delete front
7. C program to implement singly linked list and perform the following operations a) Insert at beginning b) Insert at end c) Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g) display h) search an element
8. C program to implement doubly linked list and perform the following operations a) Insert at beginning b) Insert at end c)Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g)display h)search an element
9. C program to implement circular singly linked list and perform the following operations a) Insert at beginning b) Insert at end c) Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g) display h) search an element
10. C program to implement circular doubly linked list and perform the following operations a) Insert at beginning b) Insert at end c) Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g) display h) search an element
11. C program to implement Linear search.
12. C program to implement Binary search.
13. C program to implement bubble sort.
14. C program to implement Selection sort.
15. C program to implement Insertion sort.
16. C program to implement merge sort.
17. C program to implement quick sort.
18. C program to implement bucket sort.

List of Projects:

1. Science and Numeric Applications.
2. Number theoretic algorithms
3. D Graphics and Animations
4. Large integer Arithmetic using string processing
5. To solve the problems of rotational motion, Heat transfer problems etc
6. Database/File Handling Application.
7. Game development using C
8. Algorithms in computational geometry (eg. convex-hull, closest pair of points)

9. Desktop GUIs.

10. Solving statistical problems

Text Books:

1. Y. Langsam, M. Augenstin and A. Tannenbaum, **"**Data Structures using C & c++", Prentice Hall India, Second edition, ISBN-978-81-203-1177-0.
2. Shrivastava & Shrivastava, "Data Structure through C in depth", BPB Publications ,Special Indian Edition, ISBN:8176567418

Reference Books:

1. R.L.Kruse, B.P.Leung, C.L.Tondo, "Data structure and program design in c", Prentice Hall Of India, latest edition , ISBN 0 -13-725649-3.
2. Seymour Liptsutz ,"Data Structure" , Tata Mc Graw Hill Publication, seventh reprint 2007,ISBN-13:978-0-07-060168-0
3. Y.P. Kanetkar , "Data Structure through C"., BPB publication, ISBN (978-8176567060)

Moocs Links and additional reading material: www.nptelvideos.in

Course Outcomes:

The student will be able to:

1. understand basics of data structures and Systemize incorporation of data structures in context with real world's scenarios
2. implement and demonstrate stack data structure with applications.
3. implement and demonstrate Queue data structure with applications.
4. formulate a solution for a given problem with linked version of data structures and capabilities.
5. use various types of sorting and searching techniques.
6. analyze asymptotic time complexity of an algorithm using suitable mathematical tools.

Course Name: COMPUTER ORGANIZATION AND ARCHITECTURE

Course Code: ES1045

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

Section I

Basic concepts of Digital Electronics: Computer Organization and Architecture, Structure and Function, Evolution (a brief history) of computers, Von Neumann Architecture, Evolution of Intel processor architecture- 4 bit to 64 bit, Interconnection Structures instruction execution cycle, interpretation of instructions, Instruction Pipeline

Number System and Computer Arithmetic: Integer Representation, Integer Arithmetic:2's Complement arithmetic, multiplication, Booth's Algorithm, Division Restoring Algorithm, Floating point representation: IEEE Standards for Floating point representations

RIS C Processors: RISC-Features, CISC Features, Comparison of RISC &CISC Superscalar Processors. Super pipelined Processor.

Fundamental Concepts and processor organization: Single Bus CPU organization, register ransfers, Performing anarithmetic/ logic operations, fetching a word from memory, storing a word in memory, Execution of a complete instruction. Micro-operations, Hard wired Control, Example-Multiplier CU. Micro-programmed Control: Microinstructions,

Section II

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

Hierarchical memory system- Characteristics, Size, Access time, Read Cycle time and address space. Principle of Locality of Reference. Main Memory Organization: ROM, RAM, EPROM, E^2PROM, DRAM

Cache memory Organization: Address mapping. Basic concepts: role of cache memory, Virtual Memory

Parallel Processing Paradigm – Parallelism in Uni processor system, Evolution of parallel processors, Architectural Classification, Flynn's Classification, Need and basics of Multi core architecture , Multi core Model **Case Study of Raspberry Pi Single board Computer – Raspberry Pi 0,/Raspberry pi 4**

Text Books:

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", 7th Edition, Pearson Prentice Hall Publication, ISBN 81-7758-9 93-8.
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 McGraw Hill Publication ISBN 13: 9780070315563.

2. A. Tanenbaum, "Structured Computer Organization", Prentice Hall Publication, ISBN 81 –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

6. https://www.raspberrypi.com/documentation/computers/processors.html

Course Outcomes :

The student will be able to –

1. demonstrate computer architecture concepts along with Computer arithmetic and various related algorithms
2. understand design of modern processors, Instruction pipeline.
3. illustrate the micro-operations sequencing.
4. understand concepts related to memory & IO organization
5. understand need and design of modern processor architecture.

Course Name: COGNITIVE APTITUDE

Course Code: ES1031

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

Section I

Coding Decoding, Direction Sense, Blood Relations, Analogy (word, letter, number, mixed), Ranking and Ordering, Eligibility Testing, Syllogism, Inequalities, Sitting Arrangements, Clock and Calendar, Statements & Arguments, Statements & Course of Action, Cause and Effect, Cubes and Dice, Image Analysis (mirror & water images), Cubes and Cuboid, Error Detection, Grammar, Cloze Test, Comprehension, Double Fillers, Para jumbled sentences, One-word substitution

Section II

Divisibility Rules, Numbers, Factors and multiples, Applications of HCF and LCM, Ratio, Proportion, Variation, Linear Equations, Number Systems, Ages, Averages, Percentage, Ratio and Proportion, Simple Interest, Compound Interest, Mensuration.

Time & Work, Pipes and Cisterns, Boats and Streams, Partnerships, Problems on Trains, Working with different efficiencies, Work equivalence, Division of wages, Relative Speed, Problems based on Races, Percentages as Fractions and Decimals, Fundamental Counting principle, Basics of Permutation and Combination, Probability

Text Books:

1. Dr. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publications.
2. Dr. R. S. Aggarwal, "A Modern Approach to Logical Reasoning", S. Chand Publication.

Reference Books:

1. PeeyushBhardwaj, "TheHands-on Guide to Analytical Reasoning and Logical Reasoning", Arihant Publication.
2. Arun Sharma, "How to Prepare for Logical Reasoning", McGraw Hill Publication.
3. NishitSinha, "Logical Reasoning and DI", Pearson Publication.
4. Moore, Parker, "Critical Thinking", McGraw Hill Publication.
5. Arun Sharma, "How to Prepare for Quantitative Aptitude", Tata McGraw Hill.
6. K. SarveshVerma, Quantitative Aptitude Quantum Cat Common Admission Test, Arihant Publications.

Course Outcomes :

The student will be able to –

1. improve analytical and logical reasoning ability.
2. identify and Evaluate deductive and inductive arguments.
3. identify logical errors and false conclusions.
4. improve aptitude, problem solving skills and reasoning ability.
5. critically evaluate various real-life situations by resorting to analysis of key issues and factors.
6. demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

Course Name: DESIGN THINKING 2

Course Code: ES1042

Credits: 1	**Teaching Scheme: Tut: 1 Hours / 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 journal

Indexing, impact factor, 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

Improving contents of the paper

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

Writing answers to reviewer questions: - Addressing the queries/ comments/ questions raised by Research Journal reviewers in appropriate format with sound scientific and technical justification

Modification in manuscript

Modify the research paper manuscript as per the rational suggestions given by the reviewer or Journal

Editor

Checking of publication draft

Important Task of Proof reading of the final manuscript; accepted for publication before it gets published. Meticulously checking personal details, affiliation and providing final remarks, suggestions to the Journal Publisher pertaining to the Manuscript.

Text Books:

1. Laurie Rozakis, "Schum's quick guide to Write Great Research Papers", 2 nd Edition, McGraw-Hill
2. Chris A. Mack, "How to write a good Scientific Paper", SPIE PRESS Bellingham, Washington USA (2018)
3. The Office Of Controller General Of Patents, Designs & 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", 8 th Edition, Wadsworth, Cengage Learning, Boston USA, (2011).
2. World Intellectual Property Organization,"WIPO Patent Drafting Manual", 2 nd 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.
7. address the reviewer's queries, comments and do the proof reading of the manuscript

Course Name: ENGINEERING DESIGN AND INNOVATION - II

Course Code: ES1026

Credits: 4 **Teaching Scheme: Lab: 8 Hours / Week**

Activities

This course is Project Centric Learning providing hands on experience to students. Theoretical inputs / information will be provided through Design Thinking 1 Sessions already conducted in SEM 1 while actual designing and implementations of project work is done through Engineering Design and Innovation 2 (EDI-2) Course.

Step by step Implementation of activities by the students:

1. **Group Formation Activity: -** Project group formation within the allotted EDI-2 Project batch, deciding Group leader and Assistant Group Leader
2. **Brain Storming and Discussion Activity**: - Discussion on topics for EDI-2 Project pertaining to socially relevant areas as discussed in the subject Design Thinking 2 (DT2). Discussion on Domain areas and identifying the domain area
3. **Dissuasion** on the selected domain area and required Tools and Technology also discussed in the subject Design Thinking 2 (DT2) for the project
4. **Project Planning Activity:-** Discussion on Tools and Technology, Finalization of EDI-2 Project topic considering appropriate Domain area, Tools & Technology in consultation with EDI-2 Project Guide
5. .**Project Planning Activity:-** Finalization of Problem statement, objectives, methodology and systematic strategy to complete the EDI-2 Project in consultation with EDI-2 Project guide
6. **Synopsis Drafting Activity:-** Prepare Synopsis of the planned EDI-2 Project under the guidance of EDI-2 Project guide and complete its online Registration
7. .**Team Work Activity**:- Report and update about project work progress regularly to EDI-2 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 Capstone Project appear for the timely conducted project reviews by EDI-2 Project 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. **PrototypeValidation 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 EDI-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 EDI-2 Project work in the report i.e. IEEE paper in systematic format and preparing the final PPT for final end semester assessment of the project
15. **Final checking and Report/Paper Proof Reading Activity:** - of the IEEE project paper and PPT by EDI-2 Project guide followed by its approval after doing the needful corrections.
16. Online submission of pdf of the IEEE Paper based of EDI-2 Project for the record
17. **End Semester Assessment:-** Present the IEEE Paper based of EDI-2 Project 2 project and the PPT at Student EDI-2 Project Conference on the scheduled date as part of End Semester Assessment of the EDI-2 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)
2. Pradeep Pai, Project Management, 1st Edition, PEARSON INDIA (2019)
3. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011

Reference Books:

1. H. S. Fogler and S. E. LeBlanc, "Strategies for Creative Problem Solving", 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
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) Second Edition, 2013

Course Outcomes :

The student will be able to –

1. identify projects relevant societal needs
2. map the technologies learned with 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

Course Name: MOBILE APPLICATION DEVELOPMENT

Course Code: ES1037

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

Section I

Introduction: About Android, Pre-requisites to learn Android, Dalvik Virtual Machine & .apk fileextension, Android API levels (versions & version names)

Android Java Basics: Getting started with Android development, project folder structure, simple programming, running project, generating build/APK of the app from Android Studio

First application: Creating Android Project, Android Virtual Device Creation, Set up debugging environment, Workspace set up for development, Launching emulator, debugging on mobile devices.

Basic UI design: Basics about Views, Layouts, Drawable Resources, Input controls, Input Events, Toasts.

More UI Components: Layouts – GridView and ListView, Action bar, Adapters, Menus: Option menu, context menu, sub menu, Pickers - Date and Time, Spinners.

Section II

Activity and Fragment: Activity, Fragment, Activity Lifecycle and Fragment Lifecycle.

Intents: Implicit Intents, Explicit intents, communicating data among Activities.

Navigation Drawer: Panel that displays the app's main navigation screens on the left edge of the screen

Android Notifications – Toast, Dialogs (Time Picker, Date Picker, Progress, Alert), Notification Managerand Push Notification

Introducing SQLite – SQLiteOpenHelper and creating a database - Opening and closing a database, Working with cursors Inserts, updates, and deletes

As a term project student should implement a mobile app with the following:

- Understand the app idea and design user interface/wireframes of mobile app
- Set up the mobile app development environment

List of Practical:

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi-threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.

Screen Shots of the application :

1. GUI components, Font and Colors.
2. Layout Managers and event listeners.
3. Calculator.
4. …Basic graphical primitives.
5. Database Application.
6. RSS Feed Application.
7. Multi-threading Application.
8. GPS location information.
9. Writes data to the SD card.
10. Alert upon receiving a message.
11. Alarm clock Application.

Text Books:

1. Head first Android Development.
2. Android Programming: Pushing the Limits, Wiley By Erik Hellman
3. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

Reference Books:

1. Pradeep Kothari, Android Application Development Black Book, Dreamtech Press, KLSI

Course Outcomes:

The student will be able to –

1. identify various concepts of mobile programming that make it unique from programming for other platforms
2. program mobile applications for the Android operating system that use basic and advanced phone features
3. analyse mobile applications on their design pros and cons
4. utilize rapid prototyping techniques to design
5. develop sophisticated mobile interfaces

Course Name: HUMAN ENGINEERING

Course Code: HS1033

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

Philosophy: The system of nyaya (logic) and analysis of various means of acquiring knowledge: empiric, speculative and from a person of authority.

Philosophy of sankhya (counting the elements) and an analysis of the 24 elements found in the universe as per sankhya and its basis. Connection to modern science and related research of body, mind and consciousness studies

Influence of three modes or qualities of nature on the mind and the individual. Discussion of various examples where one observes each of these qualities or a combination of them.

A brief study of the Patanjali yoga sutras and the various stages of kriya yoga and their application.

Role of Asanas (sitting postures) and pranayama (breath control) with respect to ones' body and mind

Summary of the six systems of Indian philosophy and their applications to one's personal and professional life.

Health Sciences: - Human Anatomy, General Diseases that causes impact on Human health and their Prevention and Cure, Ideal Human Health Parameters and their Measurement,

Diet and their Impact on Health and Lifestyle and their Side Effects, Life Style Management for Better Health (Modern and Vedic)

Text Books:

1. BKS Iyengar, "Light on yoga sutras of Patanjali"
2. Rajiv Malhotra, "Being Different: An Indian Challenge to Western Universalism", Happer Collins Publishers India, ISBN No: 978-93-5116-050-2.
3. SuhotraDasa, Tapovanachari, "The Six systems of Vedic Philosophy", (Online PDF book)
4. K. Park, Preventive and Social Medicine, Bhanot Publishers

Reference Books:

1. Devamrita Swami, "Searching for the Vedic India", Bhaktivedanta Book Trust, ISBN 0-89213-350-3.
2. Patita Pavan, "Sri ChanakyaNiti: Ancient Sense for Modern Success", ISBN 978-93-82109-25-9. Abhay Ashram Publishing.
3. Govinda das, "Voice your Choice: Ethics from Epics", White Woods Publishing House. ISBN: 978- 93-81-283042.
4. B. K. Mahajan, M. C. Gupta, "Textbook of Preventive and Social Medicine"
5. Jostien Garder, ."Sophies World - A Novel about the History of Philosophy", Berkeley Books, New York, USA, 1996.
6. F. Max. Muller, "The six systems of Indian Philosophy".

Course Outcomes:

The student will be able to –

1. apply the most appropriate tool of acquiring knowledge for a suitable object of knowledge.
2. understand the purpose of the 8 steps of the Yoga sutras
3. evaluate consequences of Yoga sutras on the human mind.
4. classify disease categories and identify various diseases and their impact
5. recognize ideal human health parameters and their measurements, basic emergency managements
6. demonstrate selection and maintenance of personal protective equipment

Course Name: GENERAL PROFICIENCY

Course Code: HS1037

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

Section I: Language Awareness and General Awareness

- Importance of English and foreign languages.
- Formal mechanisms of Language proficiency certifications like TOFEL, IELTS, PET, JLPT, TestDaF, DSH, TCF etc.
- Communication skills: Meaning, need, significance and types (written/oral, formal/informal, internal/external etc), Barriers in communication, How to start a communication?, Communication process (Articulation of thought) Concept of KISS(Keep It Short and Simple), Importance of nonverbal communication. Public speaking meaning, do's and don'ts
- Technical writing-Project, Innovation & Research - comparison. Writing SOPs. Importance of peer review & publications, protecting intellectual property - trademark, copyright & patents.
- Time management (Concept and importance), Techniques and rules and regulations during GD, Do's and don'ts in GD.

Section II: Human Values

- Life Skills- Empathy, Critical thinking, Creative thinking, Decision making, Coping with stress, Coping with emotion
- Understanding Value Education, Living a Fulfilling Life, Complementarity of Values and Skills, Harmony in the Human Being, Harmony in the Nature
- Universal Human Values, Human Values pertaining to the Self and the Body, Human Values pertaining to the Family, Human Values pertaining to Nature, Human Values pertaining to Existence
- Appreciating skills like negotiation, time management, positive thinking, recognizing diversity, networking etc. Contribution towards society, social initiatives**.**
- Etiquettes and manners: meaning and significance, Attitude, organizational ethics, Telephonic etiquettes, table manners, professional etiquettes, hygiene and clothing manners.
- Team building and leadership, Concept of team: difference between team and group, process of team building, significance and methods to develop team spirit, Characteristics of a leader. Walk the talk.

List of Practical:

1.Self- Introduction 2. Paragraph Writing 3. Analyse a newspaper article 4. Dialogues, Situational conversation, Relay conversation. 5. Etiquettes and manners 6. Introduction to Human values:sharing about oneself, human consciousness, 7. Harmony : difference of needs of self and body, source of imagination of self 8. Four orders of nature 9. Ethical Human conduct 10. Submission

Text Books:

1. Dr. K Alex,"Soft Skills", S.Chand and company ltd.
2. Mark Ibbotson,"Cambridge English for engineering", Cambridge university press, Delhi.
3. R R Gaur, R Asthana, G PBagaria,"A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.

Reference Books:

1. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006, ISBN:055380491X, 9780553804911
2. Shiv Khera, "You can win", A&C Black, ISBN: 9780230331198.

Course Outcomes:

The student will be able to –

1. use writing skills for formal documents.
2. demonstrate professional etiquettes in a workplace.
3. develop awareness about universal human values in students.
4. become more aware of themselves, and their surroundings.
5. translate knowledge, attitude and values into actual abilities.
6. to present sustainable solutions to the problems in society and nature.

Course Name: GENERAL PROFICIENCY

(German)

Course Code: HS1037

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

Introduction to German : Alphabets and sounds. International words in German. Introducing oneself and others. Times of the day. Greetings according to time of the day. Listening to conversations in day life situations

Grammar: Personal pronouns. Conjugations of weak verbs.

Food and drinks: Starting conversations. Meeting in Cafes. Vacbularay for food and drinks. Ordering food and paying the bill. Numbers. 1-1000. Tell and understand telephone numbers. Dates. Cities and countries. Nationalities and languages.

Grammar: Present and past tense of to be and have. Strong verbs. Forming and answering Wh questions and closed questions. Definite, indefinite articles. Singular and plural.

Living in Germany: Types of Houses , Types of Rooms, Description of rooms. Furniture in the house. Countries, nationalities and languages. Directions and telling location. Family and relationships. Hobbies and pass time activities.

Grammar: Adjectives and Opposites. Nominative and Accusative cases. Negation

Time: Writing E-Mails, Times of the day, weekdays and months. Learning clock hours, Taking formal appointments and casual meetings. Describing daily routine .Giving excuses for delays and absence. Professions and the describing responsibilities involved in that profesions.

Grammar: Possessive pronouns. Seperable verbs

Professions and responsibilities: Asking for place of work and answering Mode of transport for the same .Orientation of a workplace. Different professions and professional life .Responsibilities at the workplace.

Grammar: Wechsel prepositions and variable cases, Ordinal numbers

An excursion through Berlin: Tourism in Berlin, culture, places worth visiting, planning trips with the help of city map and bus / tram schedules. Narrating a trip. Asking for road directions and giving them to others.

Grammer: Modal verbs, writing a post card.

Text Books:

1. Studio d A1 Deautsch als Fremdsprache – Kurs- und Uebungsbuch – by Funk, Kuhn and Demme published by GOYAL SaaB and Cornelsen

Course Outcomes:

The student will be able to

1. pronounce the words correctly according German language rules and formulate small and simple sentences in German using basic grammar structures.

2. describe various types of houses and furniture items in various rooms of a house.
3. make a conversation in German in daily life situations using vocabulary related to classrooms, family, restaurants, jobs, days, months etc
4. write emails, SMS or small essays in German.
5. read and understand small texts, advertisements, instructions in German.
6. read and tell time and use it for making an appointment and cancelling it.

Course Name: GENERAL PROFICIENCY

(Japanese)

Course Code: HS1037

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

Orientation (Jikoushokai, Aisatsu & Moji)

- Theory: Orientation Lecture
- Introduction of Hiragana script with basic words
- Youon, Sokuon, Chouon – Methods of writing words
- Greetings and Classroom Expressions
- Etiquettes and mannerisms

Introduction Of Katakana (Moji Katakana)

- Introduction of Katakana script
- Introduction of Katakana rules
- Katakana words used in daily life

Calender & Numbers (Suji, Youbi, Hizuke, Jikaan)

- Introduction of numbers
- Writing Days of the week, Dates, Time, Months in Hiragana
- Special Greetings used in different situations in Japan

Basic Grammar Pattern (Bunnokatachi, Keiyoushi-To, Doushi)

- Introduction of ~は~です pattern
- Affirmative, Negative and interrogative sentences
- Introduction of demonstrative pronouns
- Learning い and な adjectives and opposites
- Introduction of some basic and useful verbs and their simple present tense

Introduction Of 3rd Script Kanji (Kanji & Kanji Jukugo)

- Basics of Kanji
- Kanji for Numbers (1-10)
- Kanji for basic words

Culture Of Japan (Nihon-No-Bunka)

- Some festivals in Japan
- Arts of Japan
- Foods and Dress of Japan
- Islands and seasons of Japan
- Some special things about and in Japan
- Revision of all topics and paper

Text Books:

1. Yoko Hasegawa, Elementary Japanese, Vol. 1, Tuttle Publishing

Course Outcomes:

The student will be able to

1. greet formally and introduce himself/herself in Japanese language with appropriate etiquetts and mannerism.
2. read and write Hiragana, Katakana, Scripts along with basic words, numbers, dates, telephone nos., days of the week, months, year, time.
3. read and write 3rd Script Kanji i.e Kanjis for nos., Days, dates, time, years as well as some basic words.
4. read/Write sentences using basic sentence pattern including all three scripts.
5. tell about his/her family. Describe things using basic adjectives and actions by using basic verbs.
6. become familier to fascinating country like Japan & Japanese culture.

Course Name: GENERAL PROFICIENCY

(French)

Course Code: HS1037

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

Introduction: Alphabets, Numbers (0-100), Months, days of the week, Difference between Tu/Vous, Self, Introduction, Date of birth, Telephone numbers, Basic salutations.

Ecole de francais, Paris: Au secretariat: Indefinite Articles (c'est ce sont) Definite Articles**,** Introduction of third person, Nationalities, professions, Irregular verbs –Etre / Avoir.

Autour de l'école: Vocabulary related to family and colours, Regular « er » ending verbs, Prepositons, Directions.

La vie quotidienne: Quelle heure est- il?, Verbs « aller, venir, faire », Interrogation (yes /no), Reflexive verbs.

Ma chambre : Vocabulary for room and house, Regular "ir" ending verbs, Concept of si, oui and non, Les adjectifs possessifs.

Une Randonnée : La négation, Concept of Jouer a/jouer de.

Text Books:

Manjiri Khandekar and Roopa Luktuke; JUMELAGE;Saraswati House Pvt Ltd.

Course Outcomes:

The student will be able to

1. greet formally as well as informally and introduce himself or herself in French, Read and write numbers, dates, telephone numbers, days of the week.
2. describe the culture of France and form grammatically correct sentences and introduce third person.
3. ask or tell the directions to reach the destination and describe your family.
4. tell and ask time, frame basic questions and describe your routine.
5. write emails, letters and small essays in French and describe your room using relevant vocabulary.
6. make negative sentences and use them in the dialogues.

Course Name: GENERAL PROFICIENCY

(Chinese)

Course Code: HS1037

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

Developing oral skills [intensive and supplementary vocabulary]

- Greetings
- Introducing Oneself and Others
- Asking for Personal Information
- Talking About Date
- Talking About Time
- Talking About Age
- Talking About Plans

Outline of Grammar, Chinese Numerals - Nominal Classifiers – Sentences with Adjectival Predicate - Interrogative Sentences - Structural Particle - Verbs and Verbal Classifiers - Interrogative Pronouns and Prepositions - Sentences with Nominal Predicate - Affirmative-Negative Questions - - Modal Particle indicating Change - Alternative Questions - Confirmation Question - Approximate Numbers - Aspect Particle indicating Completion of Action - Reduplication of Verbs - Modal Verbs

Text Books:

Beijing Language Institute. comp., CHINESE CONVERSATION FOR FOREIGNERS (LU) Vol 1 (selected lessons). Beijing: BLCUP, 2006

Course Outcomes:

The student will be able to

1. greet formally as well as informally and introduce himself or herself in Chinese, Read and write numbers, dates, telephone numbers, days of the week.
2. describe the culture of China and form grammatically correct sentences and introduce third person.
3. ask or tell the directions to reach the destination and describe your family.
4. tell and ask time, frame basic questions and describe your routine.
5. write emails, letters and small essays in French and describe your room using relevant vocabulary.
6. make negative sentences and use them in the dialogues.

Course Name: ENVIRONMENTAL SCIENCE

Course Code: ES1014

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

Section I

Nature of environmental studies: Definition, scope, importance, multidisciplinary nature of environmental studies, need of public awareness, Role of an individual in conservation and equitable use of natural resources, sustainable lifestyles, Natural resources and associated problems : Forest, water, mineral, food, energy, land resources

Ecosystems: Concept, Structure, function, characteristics of ecosystems, energy flow in ecosystem, producers, consumers, and decomposers, ecological succession

Biodiversity and its conservation: Introduction, value, hot spots of biodiversity, threats to biodiversity, conservation of biodiversity

Section II

Environment pollution: Introduction, definition, types of pollution, cause and effect of pollution, solid waste management, role of an individual in prevention of pollution, disaster management

Social issues and the environment: Unsustainable to sustainable development, urban problems related to energy, water conservation, environmental ethics, climate change, global warming, ozone layer depletion, wasteland reclamation, consumerism and waste products

Environmental protection: Environmental protection act, AIR (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife protection act, Forest conservation act, population growth and human health, human rights

Text Books:

1. Erich Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", Second Edition, UGC Publications.
2. Mackenzie L. Davis and David A. Cornwell, "Introduction to Environmental Engineering", 4e, Tata McGraw-Hill Education Private Limited New Delhi, 2010.
3. 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", 2e, Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Delhi, 2007.
2. J. Glynn Henry and Gary W. Heinke, "Environmental Science and Engineering", 2e. Pearson Education (Singapore) Pte. Ltd, 2004.

Course Outcomes:

The student will be able to –

1. Recognize renewable and non-renewable resources and associated problems and plan different

activities to create awareness among the people and hence to conserve resources by minimizing degradation of environment.

2. Understand different types of ecosystems and their importance in balancing the nature.
3. Understand concept of biodiversity at national and global level and need to preserve it.
4. Understand different types of pollutions and hence to find the remedial measures to minimize ill effects.
5. Recognize various disaster and solid waste management techniques.
6. Understand and appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

Course Name: INDIAN DEMOCRACY AND CONSTITUTION

Course Code: HS1036

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

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", Eight Edition , Justice Jasti Chelameswar

Reference Books:

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

Course Outcomes:

The student will be able to –

1. Students will analyse the democratic framework with the help of its standards of governance.
2. Students will critically examine election process in the country.
3. Students will enhance their understanding of good governance.
4. Students will analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail.

Course Name: PROFESSIONAL DEVELOPMENT

Course Code: HS1038

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

Section I: Campus Awareness and Self Awareness

- Institute information- Overall orientation, tour to college campus, Guidance to students about future.
- Branch wise Opportunities -Exposure to the department level activities, scope of the department
- Rules, dress code & Ethics-Rules to be followed on college campus, Dress code to be followed by students
- SWOC Analysis- Doing SWOC of organization, a well-known personality or friend.
- Importance of mandatory documents. Indian students must possess Aadhar, Passport, Driving License, Voter Id, Credit/ debit card, International students must have valid passport & visa approval, driving license, address proof.
- Life Skills- Appreciating skills like negotiation, time management, positive thinking, recognizing diversity, networking etc. Contribution towards society, social initiatives**.**
- Effective utilization of winter & summer vacation.
- SWOC Analysis-Self Analysis, Doing SWOC for self (Strengths, Weakness', Opportunities, Challenges)
- Career opportunities- Finding the future career opportunities, Guidance by expert, Finding own long term short term and medium term goals.
- Career planning, making choices of career - Filling up career choices form.

Section II: Professional Awareness

- General knowledge and awareness, Current affairs, technical, Financial and business
- Personal training – physiology, Family background and networking,
- Career Opportunity-Corporate job-types, Skills required for Higher studies, Public sectors, Entrepreneurship
- Corporate Jobs- IT and Non IT Jobs, Higher Studies – Education India- IIM, IIT, NIT, IIIT, Education Abroad- Country, Cost and Documents required, MBA.
- Public Sectors- Jobs, DRDO, IUCAA, ISRO, HAL
- Entrepreneurship – Startup Vs job, who wants to start, Type of start-up, Beneficial for start-up – grants , Steps for start-up, Patents, Success rate of start-up
- Resume writing, Selection Process

Submissions: Submissions to be accepted as scanned soft copy. Checklist to be prepared as follows

1. Aadhar card /(India & abroad Address proof for international students)

2. Passport 3. Driving License 4. Voter ID 5. English or foreign language proficiency proof 6. Aptitude assessment proof (Must) 7. SOP of one research statement (Must)8. Career planning form submission (Must) 9. SWOC Self – Analysis (Must)

Course Outcomes:
The student will be able to – 2. find opportunities available in her/his domain. 3. be ready to explore opportunities. 4. analyze strengths, weakness, opportunities and challenges. 5. decide his career goal and explore different career opportunities. 6. develop necessary professional skills. 7. write resume in efficient and presentable format.

Course Name: Induction Training

Course Code: HS1028

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
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, GautamBiswas, 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