



Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to SavitribaiPhule Pune University)

Structure & Syllabus of

Department of Engineering, Sciences & Humanities (DESH)

Pattern 'A-19'

F. Y. B. Tech.

Effective from Academic Year 2019-20

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

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

Content

Sr. No.	Title	Page No.
	Program Outcomes	3
	Course Structure –	4
	Course Syllabi for courses Semester I	
1	ES1001 Calculus	5
2	ES1023 Robot Mechanics and Control	7
3	CS1003 Computer Programming	9
4	ES1021 Logical Reasoning	12
5	ES1025 Engineering Design and Innovation – I	13
6	HS1030 Personality Development	15
7	ES1027 Graphics and Mechanical Workshop	16
8	HS1028 Induction Training	18
9	HS1029 Life Skills	19
	Course Syllabi for courses Semester II	
10	ES1004 Linear Algebra	23
11	CS1004 Advanced Computer Programming	25
12	ES1024 Mechatronics and Robotics	27
13	ES1022 Quantitative Aptitude	29
14	ES1026 Engineering Design and Innovation – II	30
15	CS1005 Software Development Project	32
16	ES1029 Graphics and Mechatronics Workshop	34
17	HS1032 Ethics for Engineers	36
18	HS1031 Professional Development	37
19	ES1014 Environmental Science	39

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 – Please visit www.vit.edu

F.Y. B. Tech. Structure for Semester I

FF No. 653

Course Code	Course Name	Teaching Learning Scheme				
		Th	Tut	Lab	Hrs. / Week	Credits
ES1001	Calculus	3	1	0	4	4
ES1023	Robot Mechanics and Control	3	1	2	6	5
CS1003	Computer Programming	3	1	2	6	5
ES1021	Logical Reasoning	3	0	0	3	3
ES1025	Engineering Design and Innovation – I	1	2	2	5	4
HS1030	Personality Development	1	0	0	1	1
ES1027	Graphics and Mechanical Workshop	0	0	2	2	1
HS1028	Induction Training	2	0	0	2	0
HS1029	Life Skills	2	0	0	2	0
Grand Total					31	23

F.Y. B. Tech. Structure for Semester II

Course Code	Course Name	Teaching Learning Scheme				
		Th	Tut	Lab	Hrs. / Week	Credits
ES1004	Linear Algebra	3	1	0	4	4
CS1004	Advanced Computer Programming	3	1	2	6	5
ES1024	Mechatronics and Robotics	3	1	2	6	5
ES1022	Quantitative Aptitude	3	0	0	3	3
ES1026	Engineering Design and Innovation – II	1	2	2	5	4
CS1005	Software Development Project	1	2	2	5	4
ES1029	Graphics and Mechatronics Workshop	0	0	2	2	1
HS1032	Ethics for Engineers	1	0	0	1	1
HS1031	Professional Development	2	0	0	2	0
ES1014	Environmental Science	2	0	0	2	0
Grand Total					36	27

Course Name: Calculus

Course Code: ES1001

Credits: 4

Teaching Scheme: Theory: 3 Hours / Week

Tutorial: 1 Hour / Week

Section 1

Functions of single variable: Expansions of functions: Taylor's & Maclaurin's series, Curves (Cartesian, Polar and parametric standard curves) in 2D.

Functions of two or more variables: Introduction to functions of two or more variables, Level surfaces, limits and continuity, Partial derivatives, chain rules, Jacobian, maxima and minima of functions of two variables, Method of Lagrange's multipliers.

Double Integration: Beta and Gamma function, Evaluation of double integrals, change of order.

Section 2

Triple Integration: Evaluation of double integral using Jacobian transformation, Co-ordinate systems in 3 Dimensions, Standard surfaces, Evaluation of triple integrals, Dirichlet's integral, change of variables

Vector Differentiation: Scalar and Vector point functions, tangential and normal components of velocity and acceleration, gradient, directional derivative, divergence and curl.

Vector Integration: Line integral, work done, conservative vector field, Surface integral, Theorem of Green, Stokes and Gauss

List of Tutorials:

1. Revision of basic concepts and formulae of differentiation, integration, trigonometric identities, use of scientific calculator
2. Functions of single variable, domain and range of function, properties and graphs of functions
3. Taylor's and Maclaurin's series and its applications
4. Functions of several variables, domain and range, standard quadric surfaces and evaluation of partial derivatives
5. Chain rules for partial derivatives, derivative of implicit function.
6. Jacobian, maxima and minima of functions of two variables, Method of Lagrange's multipliers.
7. Beta and Gamma function, Evaluation of double integrals.
8. Change of order, change of variables.
9. Co-ordinate systems in 3 Dimensions, Evaluation of triple integrals.
10. Dirichlet's integral, change of variables
11. Scalar and Vector point functions, tangential and normal components of velocity and acceleration, gradient.
12. Directional derivative, divergence and curl.
13. Line integral, work done, conservative vector field, Surface integral, Theorem of Green
14. Stokes and Gauss theorem.

Text Books:

1. James Stewart, "Calculus: Early Transcendental with Course Mate". 7th Edition, Cengage Learning (Indian Edition), 2017.
2. Thomas G. B. and Finney, 'Calculus and analytic Geometry', 11th Edition, Pearson Publications
3. Ron Larson and Bruce H. Edwards, 'Textbook of Calculus', Brooke/Cole, a part of Cengage Learning (Indian Edition), (c) 2011.

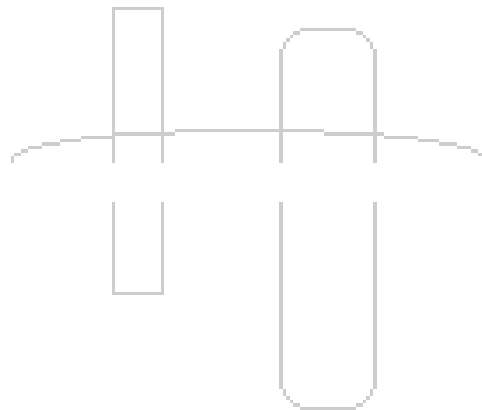
Reference Books:

1. Murray R. Spiegel, 'Advanced Calculus', Schaum's out line series, New Delhi, 1st Edition, 1981, McGraw Hill International Book Co.
2. Tom Apostol, 'Calculus', volume-II, 2nd Edition, Wiley India Edition
3. Erwin Kreyszig, 'Advanced Engineering Mathematics' 10th Edition, Dec. 2010, John Wiley and sons, Inc

Course Outcomes:

The student will be able to –

1. Recognize and identify Taylor series, infinite series and curves in plane.
2. Demonstrate the knowledge of partial derivative, chain rules, implicit functions, and extreme values of function of several variables.
3. Evaluate double integral.
4. Apply triple integral for engineering applications.
5. Interpret the properties of vector differentiation.
6. Use Gauss divergence and stokes's theorem.



Course Name: Robot Mechanics and Control

Course Code: ES1023

Credits: 5

Teaching Scheme: Theory: 3 Hours / Week

Lab: 2 Hours / Week

Tutorial: 1 Hour / Week

Section 1:

Introduction to Robotics : Basics of Robots, Specification of Robot, Classification of robots, Robot Components, Degree of Freedom, Robot coordinates.

Mechanical Components : Shaft, keys, coupling, gears, gear trains, screw, chain and sprocket, pulley drive, springs, levers, grippers and end effectors, Hydraulics and Pneumatics.

Electric Motors : DC motors – Motoring action, Left hand rule, General construction, Torque equation, EMF equation, concept of Back emf, construction of PMDC and BLDC motor, Working principle, Construction and types of Stepper motor, Servo motors – starting current, efficiency, torque-speed equations and characteristics, motor selection.

Electronics for Robotics : Analog Electronics - diode, transistor as a switch, op-amp basics, amplifiers, Digital Electronics - Logics gates, Flip-flops, Counters, Shift registers, ADC, DAC, Power Electronics - DIAC, TRIAC, MOSFETs, relays, Opto-isolators.

Section 2:

Robot mechanics: Concepts of mechanics, Force, Torque, Equilibrium, Free body diagrams, Evaluation of reactions, Beams end conditions. Simple machines and calculations. Key concepts of friction, center of Gravity etc.

Kinematics: Kinematic linkages, forward and inverse kinematics, examples, manipulators. Trajectory planning - elementary treatment, Roll-Pitch-Yaw etc.

Robot Dynamics : Concept of inertia, Moment of inertia, Kinetic Energy, Potential energy, Robot Motion, Rotary motion.

List of Practicals:

1. Study of Mechanical components.
2. Study of Electrical and Electronic components.
3. Application of transistor as a switch in relay circuit.
4. Application of logic gates.
5. LEGO kit – Know your Kit
6. LEGO kit 2 – Build a robot
7. LEGO kit 3 – Robot locomotion
8. LEGO kit 4 – Line tracer
9. LEGO kit 5 – Wall follower
10. LEGO kit 6 – Obstacle Avoidance

List of Tutorials:

1. Calculation related to circuit of transistor as a switch.
2. Building a circuit using logic gates 1.
3. Building a circuit using logic gates 2.
4. Calculations related to electrical motors 1
5. Calculations related to electrical motors 2
6. Calculations related to robot mechanics 1

7. Calculations related to robot mechanics 2
8. Calculations related to robot Kinematics 1
9. Calculations related to robot Kinematics 2
10. Calculations related to robot Dynamics 2

Text Books:

1. R. K. Mittal, I. J. Nagrath, “Robotics and Control”, Tata McGraw Hill Publication
2. David G. Alciatore, Michael B. Hstand, “Introduction to Mechatronics and Measurement Systems”, 3rd Edition, Tata McGraw Hill Publication.

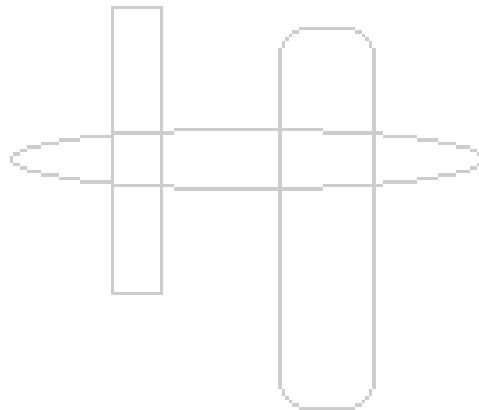
Reference Books:

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.

Course Outcomes:

The student will be able to

1. Identify different mechanical, electrical and electronics components and their applications in Robotics.
2. Apply concepts of Torque and Speed to different types of electric motors.
3. Identify different electronics components and understand their use in different circuits related to Robotics.
4. Understand the significance and make basic calculations based on mechanics, kinematics and dynamics.



Course Name: Computer Programming

Course Code: CS1003

Credits: 5

Teaching Scheme: Theory: 3 Hours / Week

Lab: 2 Hours / Week

Tutorial: 1 Hour / Week

Section 1:

Computing Fundamentals: How a data value is represented using binary symbols? Introduction to numbering systems: Decimal, Binary, Hexadecimal, Octal. Introduction to computing jargons: Nibble, Bit, Byte, Word, double word, KB, MB, GB etc. What are the major building blocks of a computer system?

Overview of C: C language history, Features of C, C Language Applications, C First Program, Program Execution, What is Compiler ? What is Interpreter? Compiler vs Interpreter C Source Vs Object Code. Types of Language: Low Level Language, High Level Language, Middle Level Language. C comments: Single Line Comment , Multi Line Comment, Rules of Writing Comments ,Single Line Vs Multi line Comment.

C variables, Constants and Data Types: Variable: token keywords & identifiers, C32 keywords, character set, variables, variable naming rules, variable declaration, variable attributes, variable categories. Constants: Constants, Constants Types, Integer Constant, Character Constant, String Constant, Escape Sequence, Backslash Characters. Data Types: enum data type example, data types, integer Data Type, enum, typedef.

Operators and Expressions in C: Operators: multiple increment operators, comma operator usage, nested size of operator, assignment operator, arithmetic operator, increment operator, decrement operator, relational operator, logical operator, conditional operators, comma operator, arrow operator, operator precedence & associativity. Expressions: expression with post increment operator, using pre/post Increment in same expression, expression with conditional & assignment operators, if statement in expression, L-Value in Expression, R-Value in Expression.

C Control Statements: if statement, if-else statement, if-else-if statement, compound if statement, comparison operators in expression, goto statement, conditional operator rules, switch case statement, switch case rules, If Statement Expression Solving, switch case invalid ways ,C mistakes – If-else if-elseif. Loop Statement: for loop, for loop – types, while loop, do-while loop, break statement, continue statement.

Section 2:

Arrays: Array Basic, Array Types, Array Declaration, Multidimensional Array, Initializing 2D Array, Array Accessing, Contiguous Memory, Mistakes – 1D array, Multidimensional Array Memory Representation, Array Limitations, Compile Time Initializing 1D Array, Array Applications. .

Strings: Strings Basics, Strings Declarations, Strings Initialization, gets() Function, getchar() Function, printf() Function, puts() Function, putchar() Function, Arithmetic Operations On Character, Reading String with Spaces, NULL Character, atoi Function, strlen function, strcat function, strcmp function, sprintf function, sscanf function, strstr function, String Reverse – Algorithm, strcpy function, scanf() function.

C Functions: C Function Calling Types, Function No Arguments & No Return Value, Function Arguments & No Return Value, Function Arguments & Return Value, passing array to function, passing entire array to function, recursion function, passing array element to function, ways of calling function, Formal Vs Actual Parameters, function writing rules, parameter passing sequence, calling function examples, function prototype declaration, parameter passing.

Pointers in C: C pointer expression for a[i][j], C Pointer, C pointer basic concept, pointer address operator, pointer memory organization, pointer variable memory required, size of pointer variable, pointer

operator, pointer declaration, initialization of pointer, dereferencing pointer, void pointers, dereferencing void pointer, size of void pointer, pointer arithmetic operations, incrementing pointer, pointer addition, decrementing pointer, subtracting integer value from pointer, subtracting pointers, comparing two pointer variables, pointer operation rules, pointer invalid operations, precedence of * and & operator, meaning of (*++ptr) pointer, meaning of (++*ptr) pointer, difference between *ptr++ & ++*ptr, double pointer example, double pointer, pointer to constant objects, constant pointers, pointer to array element, pointer to array of string, function pointer, function pointer reference, pointer to array of function, size of const pointer, Accessing Integer using char pointer, null pointer, difference char *a Vs char a[], reading complex pointer expression, pointer mistakes, dangling pointer, pointer application.

List of Practicals:

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 Pointers in C.
8. Assignment based on Array pointers.
9. Assignment Based on Function Pointers in C.
10. Assignment based on Double Pointers in C.

List of Tutorials:

All tutorials must be focusing on development of a logic, 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 $1, \frac{1}{2!}, \frac{1}{3!}, \frac{1}{4!}, \dots \dots \dots \frac{1}{n!}$
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.

Text Books:

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

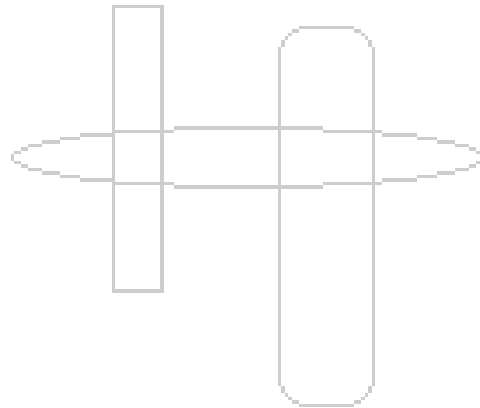
Reference Books:

1. Harry. H. Chaudhary, “C Programming :The Definitive Beginner's Reference” , First MIT-CreateSpace Inc. O-D, Publishing, LLC USA .

Course Outcomes:

The student will be able to

1. Gain a broad perspective about the uses of Computer Programming in engineering industry
2. Develop basic understanding of computer programming, the concept of procedural programming and algorithmic thinking
3. Develop the ability to analyze a problem & provide a programming solution to it.
4. Implement programming constructs to solve real world problems.



Course Name: Logical Reasoning

Course Code: ES1021

Credits: 3

Teaching Scheme: Theory: 3 Hours / Week

Section 1:

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

Section 2:

Error Detection, Grammar, Cloze Test, Comprehension, Double Fillers, Error Detection, Grammar, Para jumbled sentences, One-word substitution

Text Books:

1. Potter's Earth Academy for Career Education, "A Beginner's Guide to ELQ".

Reference Books:

1. Dr. R. S. Aggarwal, "A Modern Approach to Logical Reasoning", S. Chand Publication.
2. Peeyush Bhardwaj, "The Hands-on Guide to Analytical Reasoning and Logical Reasoning", Arihant Publication.
3. Arun Sharma, "How to Prepare for Logical Reasoning", McGraw Hill Publication.
4. Nishit Sinha, "Logical Reasoning and DI", Pearson Publication.
5. Moore, Parker, "Critical Thinking", McGraw Hill Publication.

Course Outcomes:

1. Improve analytical and logical reasoning ability.
2. Identify and Evaluate deductive and inductive arguments.
3. Identify logical errors and false conclusions.
4. Solve real time problems by assessing facts and assumptions.
5. Improve critical thinking ability.

Course Name: Engineering Design and Innovation - I

Course Code: ES1025

Credits: 4

Teaching Scheme: Theory: 1 Hours / Week

Lab: 2 Hours / Week

Tutorial: 2 Hours / Week

What is research?

- Innovation, Novelty, Creativity with example. Difference between Innovation, Novelty, Creativity. Videos of great inventions
- **Engineering research:** Meaning with one example (Case study)
- **Types of research:** Fundamental and applied with example and importance of both.

Why to do research?

- Socio-economic development, research impact on society and research impact on economy, explanation with one example for each.

Research components

- Tools, techniques and algorithms and domains in which it is used innovatively

How to arrive at research problem?

- Finding and reviewing the literature, Sources of literature, Types of research papers: Conference, Journals etc.

Conference Paper

- (International and National), what is International conference? Format of International conference: Theme, Invitation, selection process, keynote address, parallel sessions, oral and poster presentation, valedictory, selected papers for journals and explorer, conference proceedings.

Journals

- (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:

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

How to rate a Journal?

- Meaning of impact factor and citation index like h-index.
- What is impact factor? 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.

Research Paper

- 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, Internet Source.
- 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

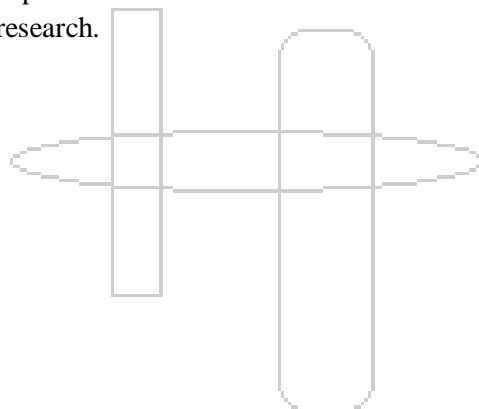
Exercises

- Calculate H-index and impact factor for given journal and given situation
- Finding list of journals in your domain
- Writing Summary of literature review
- PPT based on literature review outcomes
- Project and writing research paper based on the project

Course Outcomes:

The student will be able to –

1. Understand concepts of discovery, invention, innovation, research etc.
2. Know socio-economic impact of research.
3. Understand various research tools , its application and methods.
4. Understand process paper publication.
5. Understand the concept and process IPR.
6. Know ethical practices in research.



Course Name: Personality Development

Course Code: HS1030

Credits: 1

Teaching Scheme: Theory:1 Hour/ Week

Section 1:

Introduction & The Philosophy of Logic and Reasoning (Nyaya) (6 Hours) Introduction to “The Six Systems of Indian Philosophy of Ancient India”. The Philosophy of Logic and Reasoning (Nyaya). Sources of Valid Knowledge with their merits and de-merits. Importance of Testimony and the Logic presented to argue for the sake of a creator v/s the argument presented against one. The various objects of knowledge (Prameya): Dualism (Sankhya) and Analysis of Aspects of Reality (Vaisheshika) The Dualistic Model, French Philosopher Rene Descartes and his ideas on Dualism, Indian system of Dualism (Sankhya)

Section 2:

Analogies and Validations presented for the idea of self separate from the body, Reincarnation cases, Consciousness: The mysterious missing link. The three modes of material nature and their effects on consciousness. Analysis of aspects of Reality (Vaisheshika) : Effect of Illusion on the mind and the goal of the six systems of Indian philosophy. Detailed analysis of the nature of mind and the interaction of the mind and senses. Application of the 3 modes of nature in context of society and self

Text Books:

1. Rajiv Malhotra, Being Different “An Indian Challenge to Western Universalism”, Happer Collins Publishers India. ISBN No : 978-93-5116-050-2
2. Suhotra Dasa Tapovanachari, “The Six systems of Vedic Philosophy”, (Online PDF book)

Reference Books:

1. Devamrita Swami, Searching for the Vedic India, Bhaktivedanta Book Trust. ISBN 0- 89213-350-3
2. Patita Pavan , Sri Chanakya Niti: 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. Hornyanszky, Istvan Tasi. Nature’s IQ Balazs Torchlight Publishing ISB: 978-0-9817273- 0-1.

Course Outcomes:

The student will be able to

1. Apply the most appropriate tool of acquiring knowledge for a suitable object of knowledge.
2. Discern the reasons for the dual model of self & body and effects of the three modes on consciousness.
3. Discern Application of the 3 modes of nature in context of society and self.

Course Name: Graphics and Mechanical Workshop

Course Code: ES1027

Credits: 1

Teaching Scheme: Lab:2 Hours/ Week

Section 1:

Introduction to Lines, Lettering and Dimensioning

Demonstration of various drawing tools, Learning and using BIS standards of lettering, lines, dimensioning

Orthographic Projections

Concept, types and methods of projections with symbols, Projections of various objects, and sectional views

Fitting: Introduction, Use of measuring instruments, marking tools & hand tools such as steel rule, vernier caliper, vernier height gauge, surface plate, try square, files, hand saw, bench vice, etc. Safety precautions. Demonstration & Practice of few operations such as sawing, filing drilling etc.

Welding: Introduction. Principle of manual metal arc welding, equipment and its operation, welding electrodes, welding joints, welding symbols, Safety precautions. Demonstration & Practice of few operations such as filing, welding, chipping and drilling.

Section 2:

Isometric Drawing

Types of pictorial projections, isometric Projections and Isometric views, Construction of Isometric views from given orthographic views.

Development of Lateral Surfaces

Development of Lateral Surfaces of prism and pyramids - concept, methods, applications

Carpentry: Introduction, use of marking tools and hand tools such as marking gauge, try squares, steel rules, saws, jackplane, chisels, etc. Use of power tools, safety precautions. Demonstration & Practice of few operations such as sawing, planing, chiselling, etc.

Fire Safety: Introduction, fire prevention precautions, necessity of fire fighting, fire extinguishers, rules of fire fighting, risk elements in fire fighting, and demonstration of use of fire extinguishers.

Text Books:

1. N. D. Bhatt, "Engineering Drawing", 50th edition, Charotar Publication.
2. Dhananjai A. Jolhe, "Engineering Drawing with an introduction to AUTOCAD", 5th edition, Tata McGraw Hill education pvt. ltd., New Delhi.
3. S. N. Lal, "Engineering Drawing with an introduction to AUTOCAD first angle projection", 1st Edition, Cengage Learning, 2018.
4. C. M. Agrawal, Basant Agrawal, "Engineering Drawing" 2nd edition, Tata McGraw Hill education pvt. ltd., New Delhi.
5. Sham Tickoo, "CATIA V5-6R2014 for Engineers and Designers", Dreamtech press.
6. S. K. Hajra Chaudhary, "Elements of Workshop Technology", Media Promoters and Publishers Pvt., Ltd.
7. K.T. Kulkarni, "Introduction to Industrial Safety", Pune.

Reference Books:

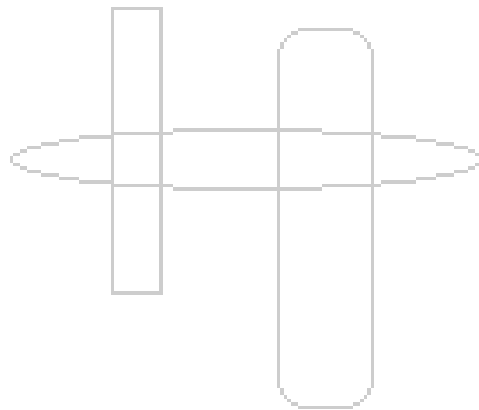
1. Warren J. Luzzader, "Fundamental of Engineering Drawing", Prentice Hall of India, New Delhi.
2. Venugopal K, "Engineering Drawing and Graphics", New Age International Publishers.
3. K. L. Narayana and P. Kannaiah, "Textbook of Engineering Drawing", SciTech Publications, Chennai.
4. Hwaiyu Geng, "Manufacturing Engineering Hand Book", McGraw Hill Publishing Co. Ltd.

5. Lawrence E. Doyle, “Manufacturing Processes and Materials for Engineering”, Prentice Hall Inc.

Course Outcomes:

The student will be able to –

1. Learn standard practices of lines, lettering and dimensioning in Engineering Drawing.
2. Visualize and draw Orthographic as well as Isometric projections of 3D objects.
3. Draw development of lateral surfaces of solids.
4. Perform few Fitting, Welding and carpentry operations and hands on skill.
5. Follow Safety practices



Course Name: Induction Training

Course Code: HS1028

Credits: Audit

Teaching Scheme: Theory: 2 Hours / Week

Section 1 :

- Physical activity
- Creative Arts
- Universal Human Values
- Literary

Section 2

- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations

Reference:

1. 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 universal human values in students.
4. Promote bonding within them and build relations between faculty members and students.

Course Name: Life Skills

Course Code: HS1029

Credits: Audit

Teaching Scheme: Theory: 2 Hours / Week

Section 1:

- Self-awareness
- Empathy
- Critical thinking
- Creative thinking
- Decision making

Section 2:

- Problem Solving
- Effective communication
- Interpersonal relationship
- Coping with stress
- Coping with emotion

Matrix of Life Skills in A Classroom

Teaching Method	Description	Benefits	Process
Class Discussion (In small or large groups)	The class examines a problem or topic of interest with the goal of better understanding an issue or skill, reaching the best solution, or developing new ideas and directions for the group.	Provides opportunities for students to learn from one another and practice turning to one another in solving problems. Enables students to deepen their understanding of the topic and personalize their connection to it. Helps develop skills in listening, assertiveness, and empathy.	<ul style="list-style-type: none"> • Decide how to arrange seating for discussion • Identify the goal of the discussion and communicate it clearly • Pose meaningful, open-ended questions. • Keep track of discussion progress
Brain Storming	Students actively generate a broad variety of ideas about a particular topic or question in a given, often brief period of time. Quantity of ideas is the main objective of brain storming. Evaluating or debating the ideas occurs later.	Allows students to generate ideas quickly and spontaneously. Helps students use their imagination and break loose from fixed patterns of response. Good discussion starter because the class can creatively generate ideas. It is essential to evaluate the pros and cons of each idea or rank ideas according to certain	<ul style="list-style-type: none"> • Designate a leader and a recorder • State the issue or problem and ask for ideas • Students may suggest any idea that comes to mind • Do not discuss the ideas when they are first suggested • Record ideas in a place where everyone can see

		criteria.	<p>them</p> <ul style="list-style-type: none"> • After brainstorming, review the ideas and add, delete, categorize.
Role Plays	Role play is an informal dramatization in which people act out a suggested situation.	Provides an excellent strategy for practicing skills; experiencing how one might handle a potential situation in real life; increasing empathy for others and their point of view; and increasing insight into one's own feelings.	<ul style="list-style-type: none"> • Describe the situation to be role played • Select role players • Give instructions to role players • Start the role play • Discuss what Happened
Small Group/Buzz Group	For small group work, a large class is divided into smaller groups of six or less and given a short time to accomplish a task, carry out an action, or discuss a specific topic, problem or question.	<p>Useful when groups are large and time is limited.</p> <p>Maximizes student input.</p> <p>Lets students get to know one another better and increases the likelihood that they will consider how another person thinks.</p> <p>Helps students hear and learn from their peers.</p>	<ul style="list-style-type: none"> • State the purpose of discussion and the amount of time available • Form small groups • Position seating so that members can hear each other easily • Ask group to appoint recorder • At the end have recorder describe the group's discussion
Games And Simulations	Students play games as activities that can be used for teaching content, critical thinking, problem solving and decision making and for review and reinforcement. Simulations are activities structured to feel like the real experience.	<p>Games and simulations promote fun, active learning, and rich discussion in the classroom as participants work hard to prove their points or earn points.</p> <p>They require the combined use of knowledge, attitudes, and skills and allow students to test out assumptions and abilities in relatively safe environment.</p>	<p>Games:</p> <p>Remind students that the activity is meant to be enjoyable and that it does not matter who wins</p> <p>Simulations:</p> <ul style="list-style-type: none"> • Work best when they are brief and discussed immediately • Students should be asked to imagine themselves in a situation or should play a structured game of activity to experience a feeling that might occur in another setting
Situation	Situation analysis	Situation analysis	<ul style="list-style-type: none"> • Guiding questions

<p>Analysis And Case Studies</p>	<p>activities allow students to think about, analyse, and discuss situations they might encounter. Case studies are real life stories that describe in detail what happened to a community, family school, or individual.</p>	<p>allows students to explore problems and dilemmas and safely test solutions; it provides opportunities to work together, share ideas, and learn that people sometimes see things differently. Case studies are powerful catalysts for thought and discussion. Students consider the forces that converge to make an individual or group act in one way or another, and then evaluate the consequences. By engaging in this thinking process, students can improve their own decision making skills. Case studies can be tied to specific activities to help students practice healthy responses before they find themselves confronted with a health risk.</p>	<p>are useful to spur thinking and discussion</p> <ul style="list-style-type: none"> • Facilitator must be adept at teasing out the key points and step back and pose some ‘bigger’ overarching questions • Situation analyses and case studies need adequate time for processing and creative thinking • Teacher must act as the facilitator and coach rather than the sole source of ‘answer’ and knowledge.
<p>Debates</p>	<p>In a debate, a particular problem or issue is presented to the class, and students must take a position on resolving the problem or issue. The class can debate as a whole or in small groups.</p>	<p>Provides opportunity to address a particular issue in depth and creatively. Health issues lend themselves well: students can debate, for instance, whether smoking should be banned in public places in a community. Allows students to defend a position that may mean a lot to them. Offers a chance to practice higher thinking skills.</p>	<ul style="list-style-type: none"> • Allow students to take positions of their choosing if too many students take the same, position, ask for volunteers to take the opposing point of view. • Provide students with time to research their topic. • Do not allow students to dominate at the expenses of other speakers. • Make certain that students show request for the opinions and thoughts of other debates. • Maintain control in the classroom and keep the

Story Telling	The instructor or students tell or read a story to a group. Pictures, comics and photo novels, filmstrips and slides can supplement. Students are encouraged to think about and discuss important (health related) points or methods raised by the story after it is told.	Can help students think about local problems and develop critical thinking skills. Students can engage their creative skills in helping to write stories, or a group can work interactively to tell stories. Story telling lends itself to drawing analogies or making comparisons, helping people to discover healthy solutions.	debate on topic. <ul style="list-style-type: none"> • Keep the story simple and clear. Make one or two main points. • Be sure the story (and pictures, if included) relate to the lives of the students. • Make the story dramatic enough to be interesting. Try to include situations of happiness, sadness, excitement, courage, serious thought, decisions, and problem solving behaviors.
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Text Books:

2. Alka Wadkar, “Life Skills for Success”, SAGE Publication.
3. Soft Skills, “Career Development Centre”, Green Pearl Publication.

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. Improve their overall wellbeing and competence.
2. Translate knowledge, attitude and values into actual abilities.
3. Use life skills effectively in diverse situation to cope with challenges of life.
4. Think critically and analyze all the pros and cons of the situation.

Course Name: Linear Algebra

Course Code: ES1004

Credits: 4

Teaching Scheme: Theory: 3 Hours / Week

Tutorial: 1 Hour / Week

Section 1:

System of Linear Equations: Rank of matrix, Elementary Matrices, System of linear equations, Gauss-Jordan Elimination. Applications of System of Linear equations.

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

Inner Product of Vector Spaces: Inner product Spaces, Orthogonal Bases: Gram Schmidt Process, Mathematical Models and Least Squares Analysis.

Section 2:

Linear Transformations: Introduction to linear transformations, Matrices for Linear Transformation, Orthogonal Transformation, Geometric properties of linear operators on \mathbb{R}^2 and \mathbb{R}^3 .

Eigen Values and Eigen Vectors: Eigen Values and Eigen Vectors of a matrix, Diagonalization, Symmetric Matrices and Orthogonal Diagonalization, Quadratic forms and its Applications.

Probability distribution: Random variable, distribution function, discrete random variable and probability mass function, continuous random variable and probability density functions, expectation and variance, some special distributions.

List of Tutorials:

1. Revision of matrix algebra
2. Rank of matrix, Elementary Matrices
3. System of linear equations, Gauss-Jordan Elimination. Applications of System of Linear equations.
4. Euclidean Vector space, Vector Space, Subspace,
5. Span of a set, Spanning Set, Fundamental Subspaces, Linear Dependence, Independence, Basis and dimension of a vector space.
6. Inner product Spaces, finding length of a vector, angle between two vectors & orthogonality
7. Orthogonal Bases: Gram Schmidt Process, Least Squares Analysis.
8. Linear transformations, kernel and range of a linear transformation
9. Matrices for Linear Transformation, one-one onto linear transformations
10. Orthogonal Transformation, Geometric properties of linear operators on \mathbb{R}^2 and \mathbb{R}^3 .
11. Eigen Values and Eigen Vectors of a matrix,
12. Diagonalization, Symmetric Matrices and Orthogonal Diagonalization, Quadratic forms and its Applications.
13. Random variable, distribution function, discrete random variable and probability mass function, continuous random variable and probability density functions,
14. Binomial, Poisson and normal distribution

Text Books:

1. David Poole, 'Linear Algebra: A Modern Introduction', 4th Edition, Cengage Learning 2015.
2. Ron Larson and David C. Falvo, 'Linear Algebra An Introduction', 1st Edition, Cengage Learning (Indian Edition).
3. Seymour Lipschutz and John J. Schiller, 'Schaum's Outline of Introduction to Probability and Statistics' (Schaum's Outline Series), 1 June 1998.

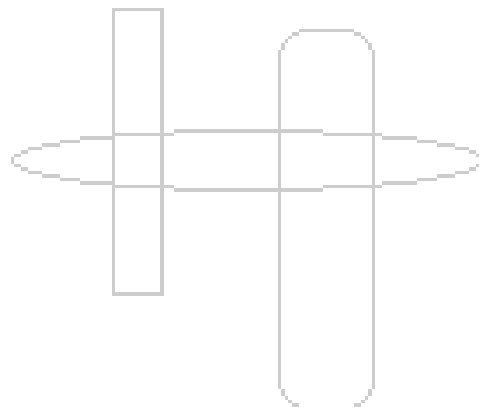
Reference Books:

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.

Course Outcomes:

The student will be able to –

1. Set up , solve and interpret linear systems.
2. Acquire the knowledge of vector spaces.
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. Compute and apply the knowledge of eigenvalues and eigenvectors.
5. Demonstrate linear transformations geometrically.
6. Analyze and interpret probability distribution.



Course Name: Advanced Computer Programming

Course Code: CS1004

Credits: 5

Teaching Scheme: Theory: 3 Hours / Week

Lab: 2 Hours / Week

Tutorial: 1 Hour / Week

Section 1:

Fundamentals of Python

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

Operators: Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, bitwise operators, Operator Precedence

Data Types and Operations: Numbers, Mathematical Functions, Trigonometric Functions, Random Number Functions, Strings, Escape Characters, String Formatting Operator, String Formatting Functions

Flow Control and Loops

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

In-built Data Structures in Python

List , Tuple , Set , Dictionary ; Mutable and Immutable Objects, Data Type Conversion ; Nesting, Built-in methods and comprehensions

Section 2:

Functions and Modules

Function Definition, Function Calling, Function Arguments, Anonymous Functions (Lambda Functions) , Function with more than one return value

Modules and Packages : Built-in Modules , Creating Modules , import Statement , import with renaming , from...import statement , import all names , Locating Modules , PYTHONPATH variable Namespaces and Scope : dir() , reload() functions , Packages in Python.

Importing modules from a Package : time , calendar , datetime Modules

File Handling and Database Programming

Opening a File , Modes for Opening a File , Attributes of file object , Closing a File , Writing to a File with Statement , Reading from a File , File Methods , Renaming a File , Deleting a File , Directories in Python , Methods: mkdir() , chdir() , getcwd() , rmdir()

Connecting to a Database , Creating Tables , INSERT , UPDATE , DELETE , READ Operations , Transaction Control , COMMIT , ROLLBACK Operations; Operation Disconnecting from a Database.

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

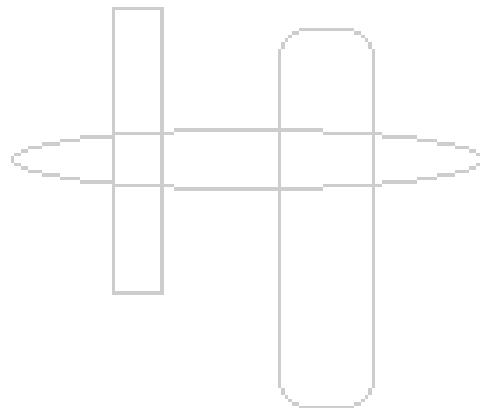
Reference Books:

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

Course Outcomes:

The student will be able to

1. Understand the power and simplicity of Python Programming.
2. Demonstrate various features and operators available in Python Programming.
3. Justify modular programming approach by making use of functions and modules
4. Implement real world problems using Python.
5. Apply file handling and data base concepts for permanent storage of data.



Course Name: Mechatronics and Robotics

Course Code: ES1024

Credits: 5

Teaching Scheme: Theory: 3 Hours / Week

Lab: 2 Hours / Week

Tutorial: 1 Hour / Week

Section 1:

Sensors : Proximity sensor (Range sensor), Tactile sensor (Contact sensor), Current sensor, Tilt sensors, 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.

Microcontroller programming & Interfacing : Introduction to Assembly language programming, Embedded C Programming, Port configuration- for Signal in and Signal out configuration and programming, Interfacing of relay, stepper motor, LCD display, keyboard, RS232, ADC etc.

Section 2:

Actuators and Control: Interfacing of Relay, Solenoid, pneumatic, hydraulic actuator basics, programming for control, motor driver and speed control – PWM.

Communication Systems: Serial communication - RS232 (programming for different modes of communication - like only transmit, only receive, both trans-receive), I2C, SPI, Wireless Communication - WiFi Bluetooth, GSM, GPS module interface.

Industrial Robotics and Applications: Introduction to different systems in Industrial Robotics, Automation, Introduction to PLC and SCADA

List of Practicals:

1. Introduction to Arduino Uno and IDE
2. Installation and Getting Familiar with Arduino IDE
3. Interfacing LED
4. Interfacing LDR
5. Automatic Street Light Control using LDR
6. Interfacing Temperature Sensor DHT11
7. Interfacing IR Sensor
8. Interfacing Ultrasonic Sensor

List of Tutorials:

1. Introduction and Types of Interrupts
2. Introduction to ADC
3. Introduction to Timer and Counter Circuits in Microcontroller
4. Design of Counters
5. Programming Practice (Simulation)
6. Programming Practice (Simulation)
7. Programming Practice (Simulation)

Text Books:

3. R. K. Mittal, I. J. Nagrath, “Robotics and Control”, Tata McGraw Hill Publication.

4. David G. Alciatore, Michael B. Hstand, “Introduction to Mechatronics and Measurement Systems”, 3rd Edition, Tata McGraw Hill Publication.

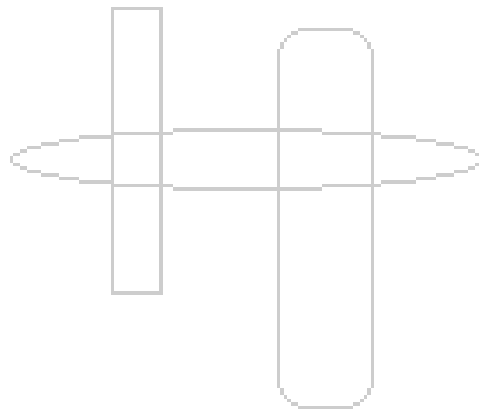
Reference Books:

3. John J. Craig “Introduction to robotics: Mechanics and Control”, Prentice Hall, 2004.
4. Richard D. Klafter, Thomas A. Chmielewski, Michel Negin, “Robotic Engineering: An Integrated Approach”, Prentice Hall Publication.

Course Outcomes:

The student will be able to

1. Identify different sensors related to Robotics and select a sensor as per the requirement.
2. Understand the internal configuration and program a use microcontroller.
3. Interface different peripherals to a microcontroller and control the same.
4. Communicate and control a Robot by using different communication protocols.



Course Name: Quantitative Aptitude

Course Code: ES1022

Credits: 3

Teaching Scheme: Theory: 3 Hours / Week

Section 1:

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

Section 2:

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. Potter's Earth Academy for Career Education, "A Beginner's Guide to ELQ"

Reference Books:

1. Dr. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. Chand Publications.
2. Arun Sharma, "How to Prepare for Quantitative Aptitude", Tata McGraw Hill.
3. K. Sarvesh Verma, "Quantitative Aptitude Quantum Cat Common Admission Test", Arihant Publications.
4. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", Fourth Quarter.

Course Outcomes:

The student will be able to:

1. Improve employability skills.
2. Improve aptitude, problem solving skills and reasoning ability.
3. Critically evaluate various real life situations by resorting to analysis of key issues and factors.
4. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

Course Name: Engineering Design and Innovation - II

Course Code: ES1026

Credits: 4

Teaching Scheme: Theory: 1 Hours / Week

Lab: 2 Hours / Week

Tutorial : 2 Hours / Week

Section 1: Basics for Projects

Importance of Project Centric Learning, **Domain Project Areas:** Awareness and identification of appropriate areas for project work such as: Agriculture, Defense, Healthcare, Smart city, Smart energy, Security Systems, Automobile, Space, Green Earth, Automobiles, Assistive Aid, Water Management, Swachh Bharat (any other socially relevant research area)

Tools: Learn and use latest engineering tools as per the project need such as : Programming (C, C++, Java, Python), Design and Modeling (MATLAB, SCILAB, Lab VIEW, Simulink), VLSI (Xilinx, Modelsim, Cadence learn), System Automation (PLC, SCADA), PADS, ORCAD, Eagle, Kicad, Embedded System (AVR Studio, Arduino, Kiel uvision), Computer Vision (OPENCV, MATLAB), Circuit Simulation (Pspice, Simulink, Workbench), Wired / Wireless and Ad-hoc Networking (NS-2, Packet Tracer), Signal Processing (Code Composer Studio) along with Integrated circuits, processor based integrated circuits :Microcontroller, electronic prototype platforms: Arduino, single board computers: Raspberry Pi, AutoCAD,(student version),CATIAV5 student edition, Proteus, Graph 4.4.2, Graphing calculator, Triplot, Origin, (any other suitable tool as per the project requirement)

Technology: Map the appropriate technology:

Artificial Intelligence, Block Chain, Robots, Cloud Computing, Energy Technology, Nanotechnology, Human Computer Interaction, New Touch Interfaces, Quantum Computing, Faster, Better Internet, Internet of Things, Big Data, Immersive Media, 3 D Printing, Cyber Security, Collaborative Technology, Geo-Spatial Technology, Wireless Power, Smart Cities, Proximity Technology, Mobile/social Internet Automation, Mobile Technologies, CX, Voice Assistants, Health Technology, Advanced Material, Clean Technology, Edge/Computing, New Screens along with Electronics, Wireless, GPS, , Sensors, Laser, Ultrasonic, automation, Remote sensing, organic electronics, mechatronics, Photovoltaics, Energy harvesting, Energy storage, automobile, remote smart grid, biomedical, waste management, food processing, signal processing, image processing, construction and structural technology, Human Machine Interface (HMI) Technology, Cloud computing, Artificial Intelligence (any other technology as per the project requirement)

Section 2: Methodology

Implementation: Selection of the domain area, Literature review, Identify and finalize the Problem Statement (student in consultation with Guide), Understand and select and use the appropriate tools, Map the technologies learned with the project needs (refer available Resources books, soft materials, relevant MOOCs, consult with domain expertise)

Designing & Testing: Designing of project prototype based on domain areas by incorporating appropriate tools and technology, validation and Testing of the prototype to give the best possible solution

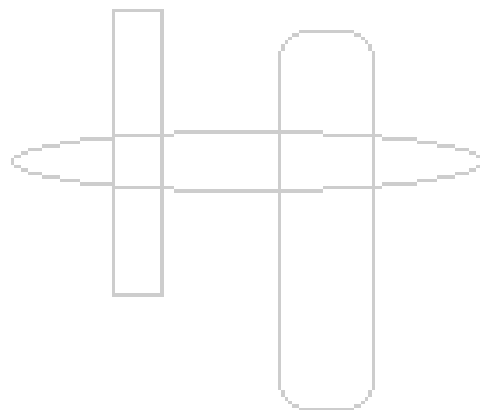
Documentation and Defence: *Develop and demonstrate the optimized prototype /working model,* Documentation of project report in stipulated format (IEEE Research paper), defence of Mini Project work at final viva voce

Note: *Theory part will be discussed some needful inputs will be provided in 10 Theory sessions and 50 sessions lab+project will be actual Hand's on in absence of Faculty*

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 solution.
4. Select best possible solution to solve the problem.
5. Develop/Fabricate a working model of proposed solution.



Course Name: Software Development Project

Course Code: CS1005

Credits: 4

Teaching Scheme: Theory: 1 Hour / Week

Lab: 2 Hours / Week

Tutorial: 2 Hours / Week

Section 1:

Overview of System and Software Development Life Cycles: Introduction, System: Definition and Discussion, System Level Project Planning, Software Development Projects, Exploratory Style of Software Development, System Development Life Cycle Definition and Overview, Software Development Life Cycle: A Brief Overview, SWDLC Models, Software Engineering Process, Software Development Planning, Use of SDP as a Management Tool, Automated Planning Tools

Software Specifications and Requirement Analysis: People Involved in the Software Development Process, Software Requirements Specification (SRS), Other Software Specification Documents, Software Specification Attributes

Software Specification Tools: Data Dictionary, Decision Support Tools, Data Flow Diagrams, Mathematical Logic, Software Development Environment, Software Development Environment Configuration, Software Development Platform (SDPF), Computer-Aided Software Engineering Tools

Section 2:

Software Design: Overview of the Software Design Process, Software Design, Object-Oriented Paradigm, Basic Definitions and Symbols, Object-Oriented Analysis, Object-Oriented Design, Implementation and Maintenance

Fundamentals of Coding/ Testing: Programming Languages, Programming Style and Program Quality, Software System Test and Integration Code Review, Software Documentation, Basic Concepts in Testing, Overview of System and Software Test and Integration, Incremental Build of Modules into Systems, Test and Integration Plan, Perspective on Build Testing, Alpha and Beta Testing, Module Level Testing, Debugging

Human Factors in Software Development: Human Factors History, HCI Requirements and Design Process, The Human as an Information System Component, Operator Task Development, Operator Characteristics, Types of User Interfaces, Fundamentals of Component-based GUI Development

List of Tutorials:

1. Project Needs Analysis, Vision, Mission, Goals
2. Project Scope Determination
3. Development of Software Requirements Specification
4. Incorporation of project management tool to schedule project plan
5. Software Specification Development: Data Flow Diagrams
6. Software Specification Development: Data Dictionary
7. Software Design: Modular Structure development
8. User Interface Design
9. Code building using appropriate coding styles
10. Code review and inspection
11. Development of test cases for white box testing
12. Change specifications and make different versions using any SCM tool

List of Projects:

1. Design an unstructured polygon with the help of raster scan methods and calculate the area of polygons by converting unstructured polygon to structured polygon also prove that the area calculated is same by using PICK's theorem.
2. Design a car and convert it into ship using computer graphics.
3. Design a robot to collect the object and place it at the different locations specified by the user.
4. Develop a system for finding out the changes in entropy and enthalpy for the various IC engines. Compare the changes and prove by implementation that entropy change affects the IC engine.
5. Use a single server system of queuing theory and develop the road traffic monitoring system.
6. Develop a software system to count the number of butterfly on a picture taken in the garden.
7. Develop the system to convert English words into Marathi using unicodes. (eg. Pune to पुणे)
8. Develop a system to convert speech to text.
9. Develop a system to convert text to speech.
10. Develop a system to Identify and detect the text displayed on images.

Text Books:

1. Ali Behforooz, Frederick J. Hudson, Software Engineering Fundamentals, Oxford University Press, ISBN: 9780195681468, 0195681460, 2006
2. Rajib Mall, Fundamentals of Software Engineering, Fourth Edition, PHI Learning Private Limited, ISBN-978-81-203-4898-1, 2014

Reference Books:

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 9th Edition, 2010, ISBN-13: 978-0137035151.
2. Soren Lauesen, Software requirements: Styles and techniques, Addison Wesley, ISBN 0201745704, 2002.

Course Outcomes:

The student will be able to

1. Apply problem-solving skills to software development and work effectively in different phases of software development life cycle.
2. Analyse requirements of computing problems and design solutions with correct problem scoping.
3. Select appropriate programming languages and diagramming techniques using a variety of software technologies.
4. Perform code review and inspection for computer programs express algorithmically.
5. Construct, test and document software systems.
6. Demonstrate effective software development teamwork skills turning ideas into successful software solutions by managing change in technological arena.

Course Name: Graphics and Mechatronics Workshop

Course Code: ES1029

Credits: 1

Teaching Scheme: Lab: 2 Hours/ Week

Section 1:

Introduction to Lines, Lettering and Dimensioning

Learning and using BIS standards of lettering, Lines and Dimensioning.

Orthographic Projection

Drawing orthographic projections from pictorial Projections by using first angle projection method, Interpretation of given views, Missing views.

Installation and Configuration of Operating system Operating system installation: Disk formatting, Disk partitioning (Dual boot), Linux installation and configuration, Software Installation: Device drivers, Anti-virus software

Introduction to Computer Network LAN setup (IP address, DNS), Basic networking commands (ipconfig, ping, etc), Accessing Remote desktop, Cable Crimping

Section 2:

Isometric Projections

Difference between isometric view and projection, drawing isometric views from given orthographic views.

Development of Lateral Surfaces

Draw the development of lateral surface of a prism and pyramid.

Circuit Testing Identification of Components, Bread board circuit and PCB circuit testing

PCB Manufacturing Prepare PCB from given circuit layout

Mini Project:

Students in groups will make an article / gadget / model / setup in involving the work of fitting, welding and carpentry work trades and / or other work trades.

List of Practicals:

1. Lines, lettering and Dimensioning .
2. Orthographic view of any machine element along with sectional view.
3. Draw Isometric view for given orthographic views.
4. Draw the development of lateral surface of a prism and pyramid.

Text Books:

1. N. D. Bhatt, "Engineering Drawing", 50th edition, Charotar Publication.
2. Dhananjai A. Jolhe, "Engineering Drawing with an introduction to AUTOCAD", 5th edition, Tata McGraw Hill education pvt. ltd., New Delhi.
3. S. N. Lal, "Engineering Drawing with an introduction to AUTOCAD first angle projection", 1st Edition, Cengage Learning, 2018.
4. C. M. Agrawal, Basant Agrawal, "Engineering Drawing" 2nd edition, Tata McGraw Hill education pvt. ltd., New Delhi.
5. Sham Tickoo, "CATIA V5-6R2014 for Engineers and Designers", Dreamtech press.
6. S. K. Hajra Chaudhary, "Elements of Workshop Technology", Media Promoters and Publishers Pvt., Ltd.
7. K.T. Kulkarni, "Introduction to Industrial Safety", Pune.

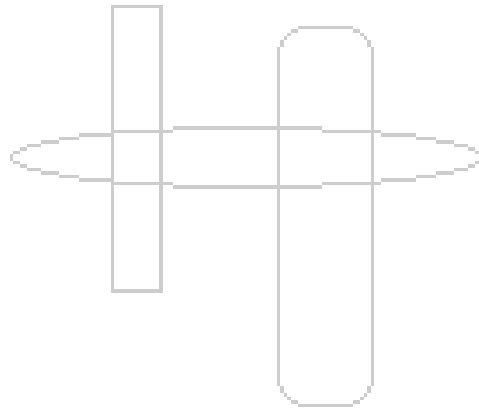
Reference Books:

1. Warren J. Luzzader, "Fundamental of Engineering Drawing", Prentice Hall of India, New Delhi.
2. Venugopal K, "Engineering Drawing and Graphics", New Age International Publishers.
3. K. L. Narayana and P. Kanniah, "Textbook of Engineering Drawing", SciTech Publications, Chennai.
4. Hwaiyu Geng, "Manufacturing Engineering Hand Book", McGraw Hill Publishing Co. Ltd.
5. Lawrence E. Doyle, "Manufacturing Processes and Materials for Engineering", Prentice Hall Inc.

Course Outcomes:

The student will be able to

1. Learn standard practices of lines, lettering and dimensioning in Engineering Drawing.
2. Visualize and draw Orthographic as well as Isometric projections of 3D objects.
3. Draw Development of lateral surfaces of solids.
4. Understand basics of operating system and system administration
5. Study computer networking fundamentals
6. Promote creativity/ innovation (mini project).



Course Name: Ethics for Engineers

Course Code: HS1032

Credits: 1

Teaching Scheme: 1 Hour / Week

Section 1:

Self-Discipline for Self-Realization, Detailed analysis of the nature of mind and the interaction of the mind and senses. The 8-fold path of Ashtanga Yoga as per Patanjali Yoga sutras and the purpose of the Yoga system. Unit IV: The Higher Deliberation (Uttara Mimamsa) (4 Hours) The Vedantic Model : The various aspects of Absolute Truth, The interaction between material nature (Prakruti) , Self (Jiva) and Absolute Self (Purusha). Comparison of the Vedantic Model with other theistic philosophies. The Bhakti Yoga model as compared to Yoga Sutras of Patanjali

Section 2:

Elevation through performance of duty (Karma Mimamsa), The Universal Law and Order (The web of Karma), Polytheistic model v/s Monotheistic model, Karma Yoga model. Universal utilities and the purpose of ritualism. Ethics from Indian Epics Ethics related to Leadership, Cooperation, Team Spirit, Competitiveness, Wealth and Friendship from Chanakya Niti and Mahabharat.

Text Books:

1. Rajiv Malhotra, "Being Different: An Indian Challenge to Western Universalism", Happer Collins Publishers India. ISBN No : 978-93-5116-050-2.
2. Suhotra Dasa Tapovanachari, "The Six systems of Vedic Philosophy", (Online PDF book)

Reference Books:

1. Devamrita Swami, "Searching for the Vedic India", Bhaktivedanta Book Trust. ISBN 0- 89213-350-3
2. Patita Pavan, "Sri Chanakya Niti: 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. Hornyanszky, Istvan Tasi, "Nature's IQ", Balazs Torchlight Publishing ISB: 978-0-9817273- 0-1.

Course Outcomes:

The student will be able to

1. Contrast the aspects of Absolute truth as laid out by the Vedanta model with the world's theistic philosophies.
2. Argue for the sake of Universal Law of Karma and the differences between monotheistic and polytheistic models.
3. Practice ethics in one's personal, professional and family life.

Course Name: Professional Development

Course Code: HS1031

Credits: Audit

Teaching Scheme: Theory: 2 Hours / Week

Section 1: Campus 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.

Section 2: Self Awareness

- 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.
- Importance of English and foreign languages. Formal mechanisms of Language proficiency certifications like TOFEL, IELTS, PET, JLPT, TestDaF, DSH, TCF etc.
- Career planning, making choices of career - Filling up career choices form.
- Project, Innovation & Research - comparison. Writing SOPs. Importance of peer review & publications, protecting intellectual property - trademark, copyright & patents.

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

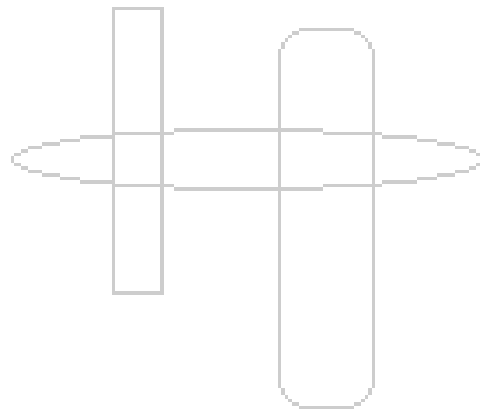
Student Roll No	GRN	Name	Aadhar card / (India & abroad Address proof for international students)	Passport	Driving License	Credit/ debit card	Voter ID	English or foreign language proficiency proof	Aptitude assessment proof (Must)	SOP of one research statement (Must)	Career planning form submission (Must)	SWOC Self - Analysis (Must)	Grade P/NP
			1	2	3	4	5	6	7	8	9	10	*
180103	1	Abcdef	Y	Y	Y	N	N	Y	Y	Y	Y	Y	

Note: *More than 7 Y ' s mandatory for Pass grade

Course Outcomes:

The student will be able to –

1. Find opportunities available in his domain.
2. Be ready to explore opportunities.
3. Analyze strengths, weakness, opportunities and challenges.



Course Name: Environmental Science

Course Code: ES1014

Credits: Audit

Teaching Scheme: Theory: 2 Hours / Week

Section 1 :

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 2:

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.

