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-16'
F. Y. B. Tech. (ECIT Group)
Effective from Academic Year 2016-17

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

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

Signed by,

Chairman – BOS   Chairman – Academic Board

Content

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.

F.Y. B. Tech. Structure for ECIT Group: Core Module Semester I and Semester II   **FF No. 653**

Course Code	Course Type	Course Name	Th	Lab	Tut	Hrs. / Week	Credits	ISA – 100 marks converted to 30			MSE (20)	ESE (100 marks converted to 50)
								CA	MSA	ESA		
Common for Semester I and Semester II												
ES101	THT	Algebraic Structures	2	0	1	3	3	30	20	50	20	100
CS101	THL	Computer Programming	3	4	0	7	5	30	20	50	20	100
ES103	THL	Electrical Engineering	3	2	0	5	4	30	20	50	20	100
EC101	TH	Electronics Engineering	3	0	0	3	3	30	20	50	20	100
HS151	TH	Indian Philosophy and Ethics	2	0	0	2	2	30	20	50	--	--
ME101	LTH	Engineering Drawing	2	2	0	4	3	30	20	50	--	--
GP1XX	L	General Proficiency	0	2	0	2	1	30	20	50	--	--
Common Total			**15**	**10**	**1**	**26**	**21**	--	--	--	--	--
Courses to be offered in Semester I only												
EC102	LTH	Hardware Workshop	1	2	0	3	2	30	20	50	--	--
HS153	LTH	Soft Skills	1	2	0	3	2	30	20	50	--	--
ES107	AU	Foundation Mathematics						30	20	50	--	--
HS101	AU	English						30	20	50		
HS155	AU	Environmental Science	2	0	0	2	Audit	30	20	50	--	--
Grand Total (Semester I)			**19**	**14**	**1**	**34**	**25**	--	--	--	--	--
Courses to be offered in Semester II only												
CS102	LTH	Software Workshop	1	2	0	3	2	30	20	50	--	--
HS154	L	General Seminar	0	2	0	2	1	30	20	50	--	--
ES108	L	Mini Project	0	4	0	4	2	30	20	50	--	--
Grand Total (Semester II)			**16**	**18**	**1**	**35**	**26**	--	--	--	--	--

F.Y. B. Tech. Structure for ECIT Group : Interdisciplinary Module Semester I and Semester II   **FF No. 653**

Course Code	Course Type	Course Name	Th	Lab	Tut	Hrs. / Week	Credits	CA	MSA	ESA	MSE (20)	ESE (100 marks converted to 50)
								ISA – 100 marks converted to 30			MSE (20)	ESE (100 marks converted to 50)
								CA	MSA	ESA		
Common for Semester I and Semester II												
ES102	THT	Multivariate Calculus	2	0	1	3	3	30	20	50	20	100
ES104	THL	Applied Physics	3	2	0	5	4	30	20	50	20	100
ME102	TH	Mechanical Engineering	3	0	0	3	3	30	20	50	20	100
ES105	TH	Engineering Mechanics	2	0	0	2	2	30	20	50	20	100
ES106	TH	Biomedical Technology	2	0	0	2	2	30	20	50	--	--
HS152	TH	Behavioral Sciences	2	0	0	2	2	30	20	50	--	--
HS1XX	LTH	International Language	2	2	0	4	3	30	20	50	--	--
GP1XX	L	General Proficiency	0	2	0	2	1	30	20	50	--	--
Common Total			**16**	**6**	**1**	**23**	**20**	--	--	--	--	--
Courses to be offered in Semester I only												
EC102	LTH	Hardware Workshop	1	2	0	3	2	30	20	50	--	--
HS153	LTH	Soft Skills	1	2	0	3	2	30	20	50	--	--
ES107	AU	Foundation Mathematics	2	0	0	2	Audit	30	20	50	--	--
HS101	AU	English						30	20	50		
HS155	AU	Environmental Science						30	20	50	--	--
Grand Total (Semester I)			**20**	**10**	**1**	**31**	**24**	--	--	--	--	--
Courses to be offered in Semester II only												
CS102	LTH	Software Workshop	1	2	0	3	2	30	20	50	--	--
HS154	L	General Seminar	0	2	0	2	1	30	20	50	--	--
ES108	L	Mini Project	0	4	0	4	2	30	20	50	--	--
Grand Total (Semester II)			**17**	**14**	**1**	**32**	**25**	--	--	--	--	--

General Proficiency Courses [Please see Annexure I]

FF No. : 654

Course Name: Algebraic Structures

Course Code: ES101   **Course Type: THT**

Credits: 3   **Teaching Scheme: Theory: 2 Hours / Week**
                                 Tut : 1 Hours / Week

Unit I: Groups I   **(5 Hours)**
Binary Operation, Semi group, Monoid, Group, Finite Group, Composition table, Abelian group, Subgroup

Unit II: Groups II   **(5 Hours)**
Permutation Group, Cyclic Group, Normal Subgroup, Lagrange Theorem, Coset, Quotient Group, Direct product

Unit III: Residue Arithmetic   **(5 Hours)**
Congruence relation, properties of congruence relation, Unique factorization theorem, modular representation, Euler $\emptyset$ function, properties of Euler $\emptyset$ function,

Unit IV: Rings and Fields   **(5 Hours)**
Groups under addition and multiplication (mod p), Ring, Polynomial Ring, Integral Domain, Field, Finite field $(Z^{*}_{p} \ \times_{p})$, Diffie-Hellman Algorithm.

Unit V: Vector Spaces   **(5 Hours)**
Rank of matrix, System of linear equations**,** Vector Space, Euclidean Vector space, Subspace, Span of a set, Spanning Set, Linear Dependence, Independence, Basis and dimension of a vector space

Unit VI: Linear Transformations   **(5 Hours)**
Matrix as a Linear Transformation, Euclidean Inner Product, Orthogonal Transformation, Geometric properties of linear operators on R^2 and R^3, Fundamental Subspaces

List of Tutorials:

Tutorial Number	Topic	Mode of Conduct
1	Binary Operation, Semi group, Monoid, Group, Finite Group	• Instructions • Basic problem solving • Home Assignment
2	Composition table, Abelian group, Subgroup	• Problem Solving • Home Assignment
3	Permutation Group, Cyclic Group, Normal Subgroup	• Problem Solving • Group Activity(Applications) • Home Assignment
4	Lagrange Theorem, Coset, Quotient Group, Direct product	• Problem Solving • Home Assignment
5	Congruence relation, properties of congruence relation, Unique factorization theorem, modular representation,	• Problem Solving • Home Assignment
6	Euler $\emptyset$ function, properties of Euler $\emptyset$ function,	• Problem Solving • Group Project

		• Home Assignment
7	Mid semester Assessment	• Viva/MCQ test/Quiz
8	Groups under addition and multiplication (mod p), Ring, Polynomial Ring	• Problem Solving • Home Assignment
9	Problems on $\left(Z_p \ +_p\right)$ and $\left(Z^*_p \ \times_p\right)$, Finite field, Integral domain	• Problem Solving • Group Activity(Applications) • Home Assignment
10	Rank of matrix, System of linear equations, Euclidean Vector space, Subspace	• Problem solving • Use of calculator • Home Assignment
11	Span of a set, Spanning Set, Linear Dependence, Independence, Basis and dimension of a vector space	• Problem solving • Group activity(Task) • Home Assignment
12	Matrix as a Linear Transformation, Euclidean Inner Product, Orthogonal Transformation	• Problem Solving • Use of calculator • Home Assignment
13	Geometric properties of linear operators on R^2 and R^3 , Fundamental Subspaces	• Problem Solving • Home Assignment
14	End semester assessment	• Viva/MCQ test/Quiz

Text Books:
1. *Rajendra Kumar Sharma, Sudesh Kumari Shah, Asha Gauri Shankar,' Algebra I A Basic Course in Abstract Algebra', Pearson.*
2. *David C Lay, 'Linear Algebra and its Applications', 3rd Edition, Pearson.*
3. *Kenneth Rosen, 'Discrete Mathematics and its applications,' 7th Edition, Tata McGraw Hill 2014.*

Reference Books:
1. *J. P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, 1st Edition ,Tata McFraw-Hill*
2. *S. Kumaresan,' Linear algebra - A Geometric approach', 1st Edition, Prentice Hall of India(Indian Edition).*
3. *Ron Larson and David C. Falvo, ' Linear Algebra An Introduction',1st Edition, Cengage Learning (Indian Edition).*

Course Outcomes:
The student will be able to –
1. acquire the concepts of algebraic structures and linear algebra
2. use properties of congruence relations, Euclid algorithm and relate matrices to linear transformations and interpret geometrically
3. demonstrate the knowledge of permutation groups , cyclic groups, rings, fields, linear dependence/independence
4. Recognize the concepts of Euler $\emptyset$ function, span, spanning set, basis, dimension, linear transformation, inner product, orthogonal transformation
5. Solve system of linear equations, polynomials in various fields, write computational table, identify type of algebraic structure, identity element in a algebraic structure, compute order of elements.

FF No. : 654

Course Name: Computer Programming

Course Code: CS101   **Course Type: THL**

Credits: 5   **Teaching Scheme: Theory: 3 Hours / Week**
                                                                Lab : 4 Hours / Week

Unit I: Introduction to programming   (8 Hours)
Problem solving using computers; algorithms and flowcharts; using simplecpp graphics commands; notion of syntax and semantics; Repeating a block of commands; Nested repeat; numerical functions; comments; Data types; identifiers; initialization; const; Input and Output; Arithmetic operators; programming idioms; Compound assignment; blocks; scope and shadowing.

Unit II: Flow of Control   (7 Hours)
Conditional Constructs: Relational and Logical Operators, various forms of if..else statements, ternary operator, switch..case statement;
Loops: Types of Loops, while, do..while, for, break and continue, goto statement.

Unit III: Array, Strings and Pointers   (10 Hours)
Arrays: Definition, syntax, element operations, memory representation, initialization. Two dimensional array, row and column major;
Applications of arrays: sorting, searching and matrix operations;
Pointers: Definition, syntax, address of operator, pointer variables, relevance of data type in pointer variables, dereferencing operator, Pointer to pointer, address arithmetic;
Array and Pointers: Accessing array elements using pointers;
Strings: Introduction, Array of characters, output, input, character string constant, Accepting multiword string, Array of strings.

Unit 4: Functions and Recursion   (7 Hours)
Functions: Introduction; definition; anatomy of function; execution of function; Scope of various types of variable; scope; local and global variables; nested function call; returning values from function; Menu driven programs;
Function and Pointers: Call by value v/s call by address, Passing array to function, returning pointers from function, dangling pointers;
Function and strings: Library functions from string.h library, building user defined functions for string operations;
Recursive Function: Definition, Examples, Types of recursion.

Unit VI: Structures   (6 Hours)
Structure: Need, Definition, syntax, declaration and initialization, structure variables, accessing and assigning values to structure variables, "dot" operator;
Applications of structure: Functions and structures, array and structure, structure within a structure, pointers and structures.

Unit 6: File handling   (4 Hours)
Introduction to file handling, using file pointers, file opening modes, reading from file, writing into file, closing file.

List of Practical:

Sr. No.	Topic
1	Graphics: Drawing basic diagrams using SimpleCpp
2	Making computer calculate stuff : calculating average, finding roots of quadratic equation, complex numbers etc.
3	Switch statement: controlling the turtle
4	Loops, Conditionals and Arithmetic operations: Converting base of a number, Generating arithmetic and geometric progressions, Buttons on Canvas, Reversing n digit number etc.
5	Example: marks display program, find min/max Generate roll numbers
6	Linear and Binary Search
7	Bubble sort
8	Insertion and Selection Sort
9	Matrix arithmetic
10	Demonstrating pointer to pointer, pointer arithmetic
11	Assignment on functions – menu driven programs, etc.
12	Using library functions
13	Implementing User defined string functions
14	Calculate factorial, generating progressions, GCD, LCM using recursion
15	Create Structures for: student result, employee payroll, library book issuing
16	File handling: Store employee records in a file

Text Books:
1. *"An Introduction to Programming through C++ ", AbhiramRanade, Mc Graw Hill Education. ISBN 978-9-33-290151-3*
2. *"Let us C", Y. Kanetkar, Second Edition, BPB Publication. ISBN: 8176566217.*

Reference Books:
1. *"Programming language – ANSI C", Brain W Kernighan and Dennis Ritchie, Second edition ISBN 0-13-110370-9*
2. *"Programming with C- Schaum's outline Series", B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7*
3. *"C By Example", Kalicharan Noel, UK, Cambridge University Press*
4. *"C How to Program", Deitel H N, Deitel P J, third edition, New Delhi, Prentice Hall of India, 2002*
5. *"A first book of C- Fundamental of C Programming", Gary Bronson and Stephen Menconi, ISBN: 0314073361,*

Course Outcomes:
Upon completion of the course, graduates will be able to –
1. Apply programming fundamentals to construct concise solutions.
2. Demonstrate available algorithmic principles to generate efficient solutions.
3. Justify modular programming approach by making use of elementary as well as superior data structures.
4. Implement programming constructs to solve real world problems.
5. Construct derived data type for real world entities.
6. Apply file handling for permanent storage of data.

Course Name: Electrical Engineering

Course Code: ES103   **Course Type: THL**

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

Unit I: D.C. Circuits   **(7 Hours)**
Ohm's law ,source transformation, Kirchhoff's law, Star delta, Network reduction, Superposition theorem, Thevenin's   theorem, Norton's theorem, Maximum power transfer theorem. numericals .

Unit II: A.C. Circuits: Single phase   **(7 Hours)**
1 phase A.C. circuit RL, RC, RLC series, and parallel, phasor diagram, Average value . R.M.S value of a.c. quantity, peak factor, form factor. Concept of active, reactive, VAR and power factor.numericals

Unit III: A.C. Circuits:Three phase   **(7 Hours)**
3 Phase a.c. supply, phase sequence, concept of line, phase, neutral etc. Phasor diagram, active, reactive, apparent, power calculation,3 phase balanced star/delta connection. Numericals.

Unit IV: Transformer   **(7 Hours)**
Single phase, working principle,e.m.f. equation, ideal and practical transformer ,equivalent circuit, lossess ,regulation, efficiency calculation. Special transformers CT/PT , ferrite core transformers. no numerical.

Unit V: D.C. Machines   **(7 Hours)**
Construction, working principle, back e.m.f, torque equations, motor types, motor characteristics, speed control methods, problems. Different starters of d.c. motors. Applications of d.c. motors.

Unit VI: A.C. Motors   **(7 Hours)**
Three phase induction motor, construction.RMF, working principles, slip ring and squirrel cage type, slip, slip torque characteristic, starters Different starters of induction motors. Applications of a.c. motors. numericals
List of Practical:

Sr. No.	Topic
1	Introduction to electrical component.
2	Load test on 1 phase transformers.
3	Load test on d.c. shunt motor.
4	Speed control of d.c. shunt motor.
5	Study of star and delta circuit.
6	Load test on three phase induction motor.

7	Lab Assignment : Electrical bill study
8	Substation visit.
9	Study of D.C. motor starter.
10	Study of A.C. motor starter

Text Books:
1. *Edward Hughes; Electrical Technology.*
2. *B.L.Theraja Vol-2; Electrical Technology.*
3. *H.Cotton; Electrical Technology.*

Reference Books:
1. *Electric Machinery,TMH(Sixth Edition)-Fitzgerald.*
2. *Electrical Machines, Drive and power system, Pearson education-Theodore Wildi.*
3. *Electric Machines,TMH-Nagrath Kothari.*
4. *Electrical Machines and transformers- Irving Kosow.*

Course Outcomes:
The student will be able to-
1. Understand different theorems and able to solve numericals on it.
2. Understand concept of single phase a.c.circuit.
3. Understand concept of three phase a.c. circuit
4. Find losses and efficiency of single phase transformer.
5. Understand construction and working of DC machines and solve numerial problems.
6. Understand construction and working of induction motor and the T-S characteristic.

FF No. : 654

Course Name: Electronics Engineering

Course Code: EC101   **Course Type: TH**

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

Unit I: Electronic Devices   **(7 Hours)**
Diode–Symbol, Structure, Concept of depletion and diffusion layer, forward and reverse diode, Ideal and Practical diode, Zener diode– breakdown, Characteristics; BJT– Symbol, Structure, Common emitter configuration and its biasing, DC load line concept, Characteristics; MOSFET– Symbol, Structure, Characteristics, Types- Enhancement and Depletion.

Unit II: Logic Gates and Boolean Algebra   **(7 Hours)**
Concepts of binary logic, Boolean Algebra, De-Morgan's Theorem, Simplification of Boolean expressions, Concepts of K-Maps; Logic gates and Truth table, NAND and NOR gate as universal gate; Half Adder, Full Adder; Flip-Flops–JK and D; Logic families–TTL, CMOS.

Unit III: Integrated Circuits   **(7 Hours)**
Concept of IC; Types of ICs–SSI, MSI, LSI, VLSI, ULSI; Package type of ICs–Metal CAN, Plastic dual in line, Ceramic flat package; Basics of Op-Amp–Symbol, Equivalent circuit, Parameters; Open loop Op–Amp configurations– Differential Amplifier, Inverting, Non-inverting, Closed loop Op–Amp configurations; 555 timer IC– Pin configuration and block diagram.

Unit IV: Analog Communication   **(7 Hours)**
Need for analog communication, Communication system, Need for modulation, Types of modulation–AM, FM and PM; Amplitude modulation– Definition, Equation, Subtypes, Basic circuit, Spectrum , Bandwidth and power requirement; Receiver.

Unit V: Filters   **(7 Hours)**
Concept of Fourier series, Concept of spectrum, Concept of Filters, Classification of filters–Passive and Active, AF and RF, Analog and Digital; Comparison of active and passive filters; Circuits for Passive filters; Active filters–Butterworth and Chebshev, Concept of Nth order filter; Design of first order low pass and high pass Butterworth filter.

Unit VI: Applications of Electronic Circuits   **(7 Hours)**
Applications of diode as regulator and rectifier; Application of Transistor as an amplifier; Registers and Counters; Applications of Op-Amp– comparator, log amplifier, V-I and I-V converters, Integrator, Differentiator; AM using diode; Study of Datasheets–Diode 1N400X, BJT BC548, MOSFET 2N7000, Op-Amp IC741, 555 timer IC, Function Generator IC8038.

Text Books:
1. Thomas L. Floyd, Electronic Devices, Pearson Education.
2. M. Morris Mano, Digital Design - 3rd Edition, Pearson Education
3. Ramakant A.Gayakwad, Op-amp and Linear Integrated Circuits , Prentice-Hall of India pvt.ltd.
*4. Louis E. Frenzel, Analog Communication , Tata Mc Graw Hill Education pvt.ltd.*

Reference Books:

1. Donald A. Neamen,Electronic Circuits, Analysis and Design, Tata-Mc Graw Hill Education pvt. ltd.

2. R. P. Jain, Modern Digital Electronics, Tata-Mc Graw Hill Education pvt.ltd

3. J. B. Gupta, Electronics Devices and Circuits, S. K. Kataria and Sons Publishing Company.

4. John M. Yarbrough ,Digital Logic: Applications and Design, West Publishing Company, 1997 Technology and Engineering.

Course Outcomes:

The student will be able to –

1. Explain the basic concepts and working of electronic devices like diode, BJT and MOSFET.
2. Illustrate digital circuits using logic gates.
3. Elaborate open loop and closed loop configurations of integrated circuits.
4. Describe the need and types of analog modulation techniques.
5. Compare the frequency response of active and passive filters.
6. Discuss the applications of electronic circuits.

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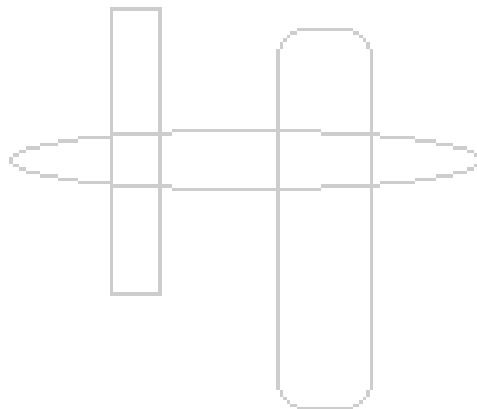
Course Name: Indian Philosophy and Ethics

Course Code: HS151   **Course Type: TH**

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

Unit I: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 knowedge (Prameya)

Unit II: Dualism (Sankhya) and Analysis of Aspects of Reality (Vaisheshika) (6 Hours)
The Dualistic Model, French Philosopher Rene Descartes and his ideas on Dualism, Indian system of Dualism (Sankhya) : 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.

Unit III: Self Discipline for Self Realization (Yoga sutras)   (4 Hours)
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 (Prkrti) , Self (Jiva) and Absolute Self (Purusha). Comparision of the Vedantic Model with other theistic philosophies. The Bhakti Yoga model as compared to Yoga Sutras of Patanjali.

Unit V : Elevation through performance of duty (Karma Mimamsa)   (4 Hours)
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.

Unit VI: Ethics from Indian Epics   (4 Hours)
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. 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. Evaluate the purpose of the 8 steps of the Yoga sutras and their consequence on the human mind.
4. Contrast the aspects of Absolute truth as laid out by the Vedanta model with the world's theistic philosophies.
5. Argue for the sake of Universal Law of Karma and the differences between monotheistic and polytheistic models.
6. Practice ethics in one's personal, professional and family life.

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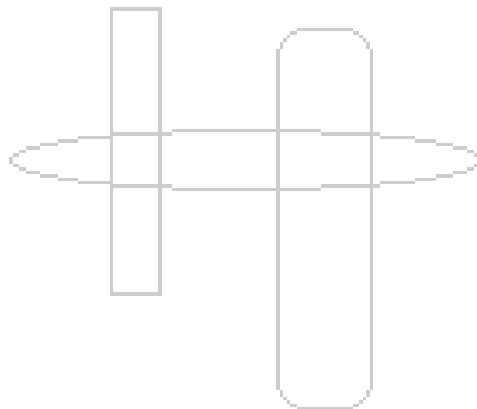
Course Name: Engineering Drawing

Course Code: ME101   **Course Type: LTH**

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

Unit I: Orthographic Projections   **(6 Hours)**
Reference Planes, Types and Methods of projections with symbols, Projections of various objects, Various types of sectional views.

Unit II: Isometric Drawing   **(5 Hours)**
Types of pictorial projections, isometric Projections and Isometric views, Construction of Isometric views from given orthographic views.

Unit III: Projections of points, lines and planes   **(5 Hours)**
Projections of points in various quadrants, Projections of lines inclined to both reference planes (lines in first quadrant only), locating traces of lines. Projections of planes inclined to both reference planes.

Unit IV: Projections of Solids   **(5 Hours)**
Projections of Solids: Classification of solids, Projections of solids such as Prism, Pyramids, Cylinder, Cone, Cube, tetrahedrons inclined to both reference planes.

Unit V: Development of Lateral Surfaces   **(4 Hours)**
Development of Lateral Surfaces of Solids (DLS): Development of Lateral Surface-concept, methods, applications.

Unit VI: Limits, Fits and tolerances   **(4 Hours)**
Concepts of limits, fits and tolerances, its application and numerical

List of Practical:

1. **Introduction to Lines, Lettering and Dimensioning**   **(3 Sessions)**
   Students will learn various types of lines and their applications. They will also learn various standard practices of dimensioning and Lettering.
2. **Orthographic Projections**   **(2 Sessions)**
   Students will draw sectional orthographic projections of simple machine components.
3. **Isometric Drawing**   **(2 Sessions)**
   Students will draw isometric drawings of simple machine components.
4. **Computer aided drafting with AUTO CAD**   **(3 Sessions)**
   a. Introduction, advantages and applications of CAD, drawing, editing and modifying
   b. Assigning annotations, dimensioning and line properties
   c. Practice problems

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. *C. M. Agawal, Basant Agrawal; Engineering Drawing; 2nd edition,Tata McGraw Hill education pvt.ltd., New Delhi.*

4. *Sham Tickoo; CATIA V5-6R2014 for Engineers and Designers; Dreamtech press.*

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 Internation Publishers.*
3. *K. L. Narayana and P. Kannaiah; Text book of Engineering Drawing; Scitech Publications, Chennai.*

Course Outcomes:

The student will be able to –

1. To learn standard practices of lines, lettering and dimensioning in Engineering Drawing.
2. Visualize and draw orthographic projections of 3D object manually and with CAD tool.
3. Visualize the object and draw isometric views for simple machine components
4. To plot the projection of lines and planes.
5. To draw the projection of solids & develop lateral surfaces of solids.
6. To understand concepts of limits, fits and tolerances

FF No. : 654

Course Name: Multivariate Calculus

Course Code:ES102   **Course Type:THT**

Credits: 3   **Teaching Scheme: Theory: 2 Hours / Week**
                                  Tut : 1 Hours / Week

Unit I: Partial Differentiation   (5 Hours)
Introduction to functions of two or more variables, surfaces,limits and continuity,Partial derivatives, chain rules , derivative of implicit function.

Unit II: Applications of partial differentiation   (5 Hours)
Homogeneous functions, Euler's theorem, Jacobian ,maxima and minima of functions of two variables, Method of Lagrange's multipliers.

Unit III: Double Integration   (5 hours)
Beta and Gamma function, Introduction to Cartesian and polar curves, Evaluation of double integrals, change of order, change of variables.

Unit IV: Triple Integration   (5 hours)
Co-ordinate systems in 3 Dimensions, Standard surfaces, Evaluation of triple integrals, Dirichlet's integral, change of variables

Unit V:Vector Differentiation   (5 hours)
Scalar and Vector point functions, tangential and normal components of velocity and acceleration, gradient, directional derivative, divergence and curl.

Unit VI: Vector Integration   (5 hours)
Line integral, work done, conservative vector field, Surface integral, Theorem of Green, Stokes and Gauss.

List of Tutorials:

Tutorial Number	Topic	Mode of Conduct
1	Functions of two or more variables, surfaces, Evaluation of partial derivatives.	• Instructions • Basic problem solving • Home Assignment
2	Chain rules for partial derivatives , derivative of implicit function.	• Problem Solving • Home Assignment
3	Homogeneous functions, Euler's theorem, Jacobian.	• Problem Solving • Home Assignment
4	maxima and minima of functions of two variables, Method of Lagrange's multipliers.	• Problem Solving • Group Project • Home Assignment
5	Beta and Gamma function, Introduction to Cartesian and polar curves, Evaluation of double integrals.	• Problem Solving • Home Assignment
6	change of order, change of variables.	• Problem Solving • Demonstration on curves

		• Home Assignment
7	Mid semester assessment	• Viva/MCQ test/Quiz
8	Co-ordinate systems in 3 Dimensions, Standard surfaces, Evaluation of triple integrals.	• Problem Solving • Demonstration on surfaces. • Home Assignment
9	Dirichlet's integral, change of variables	• Problem Solving • Home Assignment
10	Scalar and Vector point functions, tangential and normal components of velocity and acceleration, gradient.	• Problem solving • Home Assignment
11	directional derivative, divergence and curl.	• Problem solving • Group activity(Task) • Home Assignment
12	Line integral , work done, conservative vector field, Surface integral, Theorem of Green	• Problem Solving • Group Project(Applications) • Home Assignment
13	Stokes and Gauss theorem.	• Problem Solving • Home Assignment
14	End semester assessment	• Viva/MCQ test/Quiz

Text Books:
1. *Thomas G. B. and Finney, 'Calculus and analytic Geometry', 11ᵗʰ Edition,Pearson Publications*
2. *Erwin Kreyszig, 'Advanced Engineering Mathematics'10ᵗʰ Edition,Dec. 2010, , John Wiley and sons, Inc*

Reference Books:
1. *Ron Larson and Bruce H. Edwards, 'Text book of Calculus', Brooke/Cole, a part of Cengage Learning (Indian Edition), (c) 2011.*
2. *Murray R. Spiegel, 'Advanced Calculus', Schaum's out line series, New Delhi, 1st Edition, 1981, McGraw Hill International Book Co.*
3. *Tom Apostol, 'Calculus', volume-II, 2ⁿᵈ Edition, Wiley India Edition*

Course Outcomes:
The student will be able to –
1. Acquire the knowledge of partial derivatives, vector differentiation and line integrals.
2. Apply the knowledge of partial derivative to find maxima and minima of functions of two variables, change of variables to evaluate double and triple integral.
3. Interpret and analyze properties of jacobians, gradient , curl and divergence.
4. Demonstrate the use of special functions in solving improper integrals , evaluation of multiple integrals.
5. Recognize, identify curves and surfaces, scalar and vector point functions, order of integration, homogeneous functions.

Course Name: Applied Physics

Course Code: ES104   **Course Type: THL**

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

Unit I: Optics   (7 Hours)
Interference: Thin film interference, Colours in thin films, Michelson's interferometer, Applications: Wavelength and thickness, Antireflection coatings, Interference filters,
Diffraction: Fresnel and Fraunhofer diffraction, Single slit Fraunhofer diffraction, diffraction grating (Qualitative), Dispersive power, Rayleigh's criterion, Resolving power of grating and telescope**,** X - ray diffraction, Laue Experiment, Bragg's law,
Polarization: Brewster's law, Malus law, Double refraction (Huygen's theory), Retarders**,** Quarter and half wave plate, circular and elliptical polarization, Polarized light production and analysis, Applications: Polaroid goggles and 3D – Movies, Liquid Crystal Display (LCD),

Unit II: Electron Optics and Special Theory of Relativity   (7 Hours)
Electron Optics: Electron motion in electric (parallel and perpendicular) and transverse magnetic field, Crossed Electric and Magnetic Fields, Electrostatic and Magneto-static Focusing, Applications: Cathode Ray Tube, Scanning Electron Microscope,
Special Theory of Relativity: Physical Event, Frames of References, Galilean Relativity, Michelson Morley Experiment (Qualitative), Lorentz Transformations of Space, Time and Velocity, Einstein's formulation of special relativity, Length Contraction, Time Dilation, Relativistic Mass (Qualitative), Momentum, Force, Mass and Energy, Applications: e.g. Nuclear, Energy, (Gravitational and Relativistic Time Dilation Effects: Satellite Communication, Global Positioning System (GPS)),

Unit III: Quantum Mechanics   (7 Hours)
Matter Waves: Limitations of classical mechanics (Rutherford's atomic model, Black body radiation, Photoelectric effect, Bohr atom model) and need of quantum mechanics, Wave particle duality, de-Broglie's hypothesis, Davisson - Germer Experiment, Phase and Group velocity, Heisenberg's uncertainty principle, Single slit electron diffraction, γ – ray microscope, Applications of uncertainty principle,
Wave Equations: Wave function (ψ), Max Born's interpretation, Physical significance of ψ and ψ^2, Schrödinger's wave equations and it's applications: 1 D - Infinite potential well, Finite potential well (Qualitative), Tunneling effect: Tunnel Diode, Scanning Tunneling Microscope (STM),

Unit IV: Semiconductor Physics   (7 Hours)
Semiconductors: Quantum numbers, Kronig-Penny Model (Qualitative), Band Theory of Solids, Energy Bands in C (Graphite, Diamond), Si, Ge, Sn, Ohm's Law (Microscopic), Direct and Indirect Band gap, Temperature Dependence of Conductivity, Hall Effect, Fermi Level, Fermi-Dirac Probability Distribution Function, Fermi Level in Intrinsic (derivation) and Extrinsic Semiconductors (Effect of Temperature and Doping Level on Fermi Energy), Working of p-n Junction Diode from Energy Band Diagrams, Light Emitting Diode, Photodiode, p-n-p and n-p-n transistor and energy band diagrams, Photovoltaic Effect: Solar Cell Working and Characteristics
Introductory Nanotechnology: Nanomaterials, Properties (Quantum size effects: optical, electrical, magnetic, structural and mechanical), 0, 1, 2 Dimensional Nanostructures, Nanomaterial Synthesis Techniques (Physical, Chemical etc.), Applications: Energy, Space, Electronics, Defense, Textile, Cosmetics, Medical, Environment, Automobiles,

Unit V: Lasers and Fiber Optics   (7 Hours)
Lasers: Stimulated Absorption, Spontaneous and Stimulated Emission, Population Inversion, Basic Requirements for Lasing Action, Laser Properties, Ruby Laser, He-Ne Laser, Semiconductor Diode Laser (Principle, Construction and Working), Applications: (Industry : Drilling, Welding and Micromachining, Medical: Laser Eye, Skin, Cosmetic Surgery, Military Applications: Laser range detection, Laser Guided Missiles),
Fiber Optics: Optical Fiber, Total Internal Reflection, Acceptance Angle and Cone, Fractional Refractive Index Change, Numerical Aperture, Modes of Propagation, Types of Optical Fibers, Losses in Optical Fiber, Applications: Fiber Optics Communication System,

Unit VI: Magnetic Materials and Superconductivity   (6 Hours)
Magnetic Materials: Magnetic field (B), Permeability, Magnetic Field Strength (H), Magnetic Susceptibility, Magnetization, The Bohr Magnetron, Curie's Law, Hysteresis, Magnetic materials: Dia, para, ferromagnetic, ferrimagnetic, Aapplications: Transformer cores, Electromagnetic shielding,
Superconductivity: Properties (Zero Resistance, Meissner Effect, Critical Fields, Persistent Currents, Critical Current Density, London Penetration Depth, Isotope Effect), Type I and II Superconductors, BCS Theory, High T_c Superconductors and it's preparation, DC and AC Josephson Effect, Applications: Superconducting Quantum Interference Devices (SQUID), Transmission Lines, Superconducting Magnets, Maglev Trains etc.

List of Practical: (Students will perform any Five experiments as per following code of conduct in physics laboratory)

Sr. No.	Name of the Experiment	Mode of Conduct
1.	Determination of Wavelength of Light using Michelson's Interferometer	
	Use of diffraction grating for the determination of wavelength of spectral line and determination of resolution of spectral lines using diffraction grating and spectrometer	
2.	Polarization by Refraction: Malus Law	Any one of two / three to be performed by students and other for demonstration of working principle.
	Determination of Brewster's angle for glass surface and refractive index of glass.	
	Demonstration of Lissajous figures using a CRO (Principle of interference) concepts of polarization – Plane, Circular and Elliptical Polarization	
3.	Determination of band gap of a semiconductor.	
	Hall Effect, determination of Hall coefficient.	
4.	Characteristics of solar cell, calculation of fill factor.	
	Study of diode characteristics (PN, Zener, Tunnel, Photodiode, Light Emitting Diode etc.)	
5.	Determination of wavelength and thickness of wire using LASER and determination of beam divergence of LASER.	
	Optical fibre communication system	
6.	Course Project Work	Projects will be allotted in groups at the beginning of semester.
7.	Course Project Work	
8.	Course Project Work	
9.	Course Project Work	

10.	Course Project Work	
11.	Course Project Work	
12.	Course Project Work	

In addition to above experiments students must perform the following all experiments in virtual laboratory environment which is developed by Amrita Vishwa Vidyapeetham under the NME ICT initiative of MHRD, Government of India.

Sr. No.	Name of the Experiment	Link
1	Michelson's Interferometer- Refractive index of glass plate	http://vlab.amrita.edu/?sub=1&brch=189&sim=1519&cnt=1
2	Michelson's Interferometer- Wavelength of laser beam	http://vlab.amrita.edu/?sub=1&brch=189&sim=1106&cnt=1
3	Diffraction Grating	http://vlab.amrita.edu/?sub=1&brch=281&sim=334&cnt=1
4	Brewster's Angle determination	http://vlab.amrita.edu/?sub=1&brch=189&sim=333&cnt=1
5	Emission spectra	http://vlab.amrita.edu/?sub=1&brch=195&sim=359&cnt=1
6	Photoelectric effect	http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1
7	Determination of Planck's Constant	http://vlab.amrita.edu/?sub=1&brch=195&sim=547&cnt=1
8	Hall effect experiment:- Determination of charge carrier density	http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1
9	Characteristics of Zener diode	http://vlab.amrita.edu/?sub=1&brch=282&sim=1522&cnt=1
10	Solar Panel Experiment (Remote Trigger)	http://vlab.amrita.edu/?sub=1&brch=195&sim=360&cnt=1
11	Laser beam divergence and spot size	http://vlab.amrita.edu/?sub=1&brch=189&sim=342&cnt=1
12	Numerical Aperture of Optical Fiber	http://vlab.amrita.edu/?sub=1&brch=189&sim=343&cnt=1
13	B-H Curve	http://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=1
14	Magnetic Material Characterization via Hystersis (Remote Trigger)	http://vlab.amrita.edu/?sub=1&brch=195&sim=800&cnt=1

Text Books:

1. *M.N. Avadhanalu, P.G. Kshirsagar; A Textbook of Engineering Physics, Revised Edition 2014, S. Chand Technical Publishers, New Delhi,*
2. *A. Beiser, Concepts of Modern Physics, (6th) New 2005, Tata McGraw Hill Pub. Co., New Delhi,*
3. *H. K. Malik, A. K. Singh, Engineering Physics, 2010, Tata McGraw Hill, New Delhi,*

Reference Books:

1. *R. J. Serway and J. W. Jewett, Physics for Scientists and Engineers with Modern Physics, 5th / 6th / 7th Edition 2010, Thomson / Cengage Learning, New Delhi,*
2. *Young and Freedman, University Physics, 10th / 11th / 12th / 13th Edition, Pearson Education*
3. *Resnick and Halliday, Fundamentals of Physics, 8th /9th /10th Edition, John Wiley and Sons.*

Course Outcomes:

The student will be able to –

1. distinguish, analyze, determine the physical terms from thin film interference, diffraction, polarization and to measure experimentally (wavelength, spectral resolution etc.)
2. justify, infer, differentiate, calculate terms related to electron motion in electric, magnetic fields while mass, space, time, velocity, momentum, energy, mass – energy equivalence etc.) in relativistic situations and experiment on CRO.
3. recognize, effectuate, utilize, the fundamental principles of quantum mechanics to solve problems and to interpret the applications in the quantum regime.
4. derive, draw, evaluate, compute the physical terms in semiconductor physics (Fermi Energy, Energy band diagrams etc.), and to experiment the basic semiconductor devices(e.g. solar cell, pn junction diode etc.) and differentiate, analyze the properties at nano scale, nanomaterials and interpret their applications.
5. differentiate, correlate, different lasers (e.g. He-Ne laser, Ruby laser etc.) construe their working mechanism, also analyze, evaluate the fundamental terms in fibre optics (e.g. acceptance angle, numerical aperture etc.) their applications, experiment (on lasers fibre optics).
6. analyze, interpret, distinguish and calculate the basic terms, properties related with magnetism (magnetization, magnetic moment etc.) and superconductivity (e.g. critical temperature, penetration depth etc.) and elucidate their applications.

FF No. : 654

Course Name: Mechanical Engineering

Course Code: ME102   **Course Type: TH**

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

Unit I: Drives and Mechanisms   **(9 Hours)**
Power transmission devices: Construction, working, comparison and applications of Belt drive (numerical), rope drive, chain drive, gear drive, Mechanisms (Kinematic pair, chain, inversions)
Introduction, classification, Basic parts (Motor Cycle & Car)

Unit II: Thermal Engineering   **(7 Hours)**
Thermodynamic system, properties, thermodynamic processes and cycles, laws and applications, heat sink, source, Carnot cycle, heat engine, heat pump, refrigerator

Unit III: Heat transfer   **(6 Hours)**
Modes of heat transfer, Conduction: Fourier laws of hear conduction, Heat conduction through plane and composite walls, Convection: Mechanism, classification of fluid flows, Newton's law of cooling, Nusselt number, Velocity and thermal boundry layer, Prandtl number, Reynold's number,Radiation: basic concepts, Stephen-Boltzman's law, kirchhoff's law, Planck's law and Wien's law

Unit IV: Power Engineering   **(10 Hours)**
Power Producing Device: Types, working principles and applications - Boilers, Turbines, I.C. engines
Power Absorbing Devices: Types, working principles and applications - Pumps, compressors
Power Generation: Plant layout, components and functions of - Thermal, hydroelectric, solar, wind power plant

Unit V: Manufacturing Processes   **(6 Hours)**
Manufacturing Processes: Casting (types, advantage, limitations, applications), metal forming (types, principles, advantages, defects, applications), Machining (shaping, planning, turning, boring, drilling, milling), metal joining (welding, soldering, brazing), plastic processing (injection moulding, blow moulding, extrusion).

Unit VI: Engineering Materials   **(4 Hours)**
Engineering Materials: Mechanical properties of materials, material classification, factors affecting material selection, fiber reinforced composites

Text Books:
1. *P K Nag, 'Engineering Thermodynamics', Third Edition, Tata Mcgraw-Hill.*
2. *S S Rattan, 'Theory of Machines', Fourth Edition, Tata Mcgraw-Hill.*
3. *Kirpal Singh, 'Automobile engineering', Thirteenth Edition, Standard Publishers, Delhi.*
4. *Ghosh & Mallik, 'Manufacturing science', Second Edition,EWP Publications.*
5. *R K Rajput, 'Thermal Engineering', Ninth Edition, Laxmi Publications, Delhi.*

Reference Books:
1. *V Ganeshan, 'Internal Combustion Engines', Third Edition,Tata McGraw-Hill.*
2. *P N Rao, 'Manufacturing Technology', Fourth Edition McGraw-Hill Publications.*

Course outcomes:

At the end of this course, student will be able to-
1. Understand various mechanical drives and learn basics of mechanisms and automobiles.
2. Understand basic concepts of thermal engineering.
3. Understand different modes of heat transfer and their governing laws.
4. Understand working principles of power plants and devices.
5. Understand various manufacturing processes
6. Understand mechanical properties of material
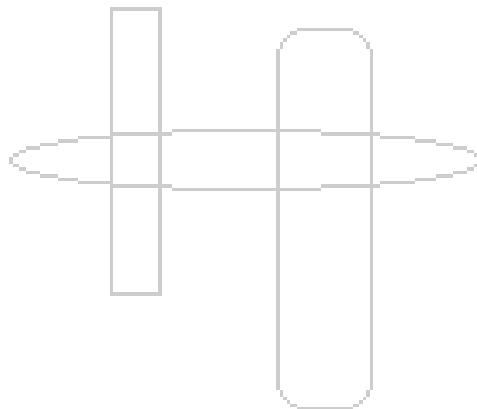
Course Name: Engineering Mechanics

Course Code: ES105   **Course Type: TH**

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

Unit I: Basics of Statics: **(6 Hours)**
Review: Types of Mechanics, historical development, idealization, SI units, prefixes & their conversions, scope of study, Definition of force, surface forces, body forces, internal and external force, push and pull force, Tension and Compression force.
Various force systems, six fundamental principles of mechanics.
Coplanar Force System: Rectangular & skew resolution of force ,composition of forces, resultant and equilibrium of particle, Moment of force, Varignon's theorem, couple, and equivalent force couple system,
Application to find resultant of: concurrent, parallel and non concurrent non parallel force system.

Unit II: Non-coplanar Force System: **(4 Hours)**
Vector representation of force, rectangular components of a force, direction angles, direction cosines, unit vector, position vector, dot product and cross product, types of supports and support reactions. Moment of force about a point & about an axis, Resultant and equilibrium of concurrent, parallel & general force systems,

Unit III: Equilibrium of Rigid Bodies (2D) :   **(5 Hours)**
Conditions of equilibrium in coplanar and non coplanar force system. Concept of free body diagram, types of supports, loads & beams, Determination of reactions at supports for various types of loads on beams (simply supported,cantilever,compound).
Application of equations of equilibrium to simple frictionless rigid body assemblies.

Unit IV: Kinematics of Rectilinear Motion: **(5 Hours)**
Review:Defination of motion (planar and space),types of motion (translation,rotation,general plane motion), Rectilinear Motion**:** concept of position, displacement, distance, speed, average & instantaneous velocity and acceleration, uniform motion, uniformly accelerated motion, constant acceleration equations, gravitational motion & its equations.
Variable acceleration: primary and secondary equations of motion, general approach for determination of motion of a particle, application to variable acceleration, motion curves.

Unit V: Kinematics of Curvilinear motion: **(5 Hours)**
Motion along plane curved path, Concept of of position, displacement, distance, speed, average & instantaneous velocity and acceleration, curvature, radius of curvature in curvilinear motion.
Application to find velocity and acceleration in three systems: rectangular coordinate (x-y), normal and tangential (n-t), radial and transverse (r-θ).

Unit VI: Kinetics of a particle: **(5 Hours)**
Force and acceleration: introduction to kinetics, Newton's second law of motion, D-Alembert's principle (dynamic equilibrium), concept of FBDE, working concept of application of $F = ma$ in curvilinear motion in vertical and horizontal plane followed by numerical on
(i)   Rectangular components (ii) tangential and normal components.

Text Books:
1. *J. L. Meriam, L. G. Kraige; Engineering Mechanics Statics & Dynamics - 5th edition, John Wiley & Sons, Inc. Publication.*
2. *F. P. Beer and E. R. Johnston; Vector Mechanics for Engineers Statics & Dynamics- 9th edition, Tata McGraw-Hill Publications.*

Reference Books:
1. *E.W. Nelson; Schaum's Outlines : Engineering Mechanics Statics & Dynamics, McGraw-Hill Publications.*
2. *R. C. Hibbeler; Engineering Mechanics Statics & Dynamics, Pearson Publication.*

Course Outcomes:
After successful completion of this course, students will be able to
1. Evaluate resultant, moment of force and apply equilibrium equations to coplanar force system.
2. Determine resultant, moment of force and apply equilibrium equations for non-coplanar force system.
3. Apply equilibrium equations to beams and simple frictionless rigid body assemblies
4. Define the differential equations of rectilinear motion and represent this motion graphically.
5. Investigate particle motion along a curved path using different coordinate systems.
6. Analyze the force-acceleration motion of particle using equations of motion using different coordinate systems.

FF No. : 654
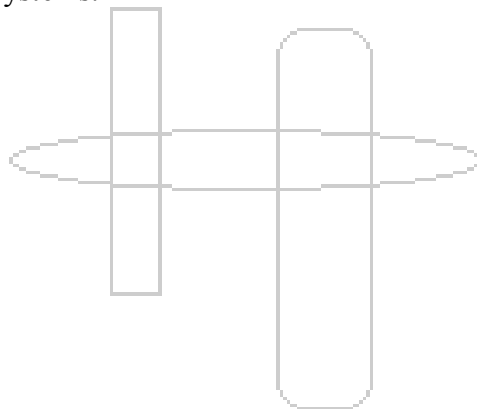
Course Name: Biomedical Technology

Course Code: ES106   **Course Type: TH**

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

Unit I: Human Anatomy   **(6 Hours)**
[A] Delivery Content: Cardiovascular System; Structure and working of Heart, Electro conduction System of Heart, Circulatory System, Composition of Blood and its Functioning, Nervous System; The Neuron structure, Structure and Functions of CNS (Brain and Spinal cord), PNS and ANS, Respiratory system; Organs of Respiration, Mechanism of Breathing, Regulation of Respiration (Lung Functioning),
[B] Learner's Assignment: Analysis of Haemogram and Lipid Profile Test data

Unit II: Physiological Parameters I   **(3 Hours)**
[A] Delivery Content: Basic Electrode Theory, Electrode Model Circuit, Types of electrodes (Passing Reference), Body Temperature Measurement System - Thermometer, Incubator, Electroencephalograph (EEG) and its Recording, Heart related Parameters such as Electrocardiograph (ECG) and its Recording
 [B] Learner's Assignment: Analysis of ECG and EEG for finding abnormalities in the functioning of Heart and Brain respectively (One analysis for three different groups)

Unit III: Physiological Parameters II   **(3 Hours)**
[A] Delivery Content: Heart related Parameters such as Blood Pressure Measurement, Pulse Rate Measurement, Pulse Oximeter, Blood Cell Counter, Spiro Meter and Pacemaker
[B] Learner's Assignment: Case study of Blood Pressure Measurement, Pulse Rate Measurement, Pulse Oximeter data, Blood Cell Count and Spirogram (One of the case studies for each different group)

Unit IV: Imaging system   **(6 Hours)**
[A] Delivery Content: X-ray (Principal, Construction and Working of Equipment) and Computed Tomography (Principal, Construction and Working of Equipment), Magnetic Resonance Imaging (Principal, Construction and Working of Equipment), Ultrasonic Imaging (Principal, Construction and Working of Equipment), Positron Emission Tomography (Principal, Construction and Working of Equipment)
[B] Learner's Assignment: Study differences between above imaging systems (X ray, CT, MRI, Ultrasound and PET)

Unit V: Anthropometry and Ergonomics   **(5 Hours)**
[A] Delivery Content: Anthropometry and Design, Principles of Work Design; The Workplace, Principles of Work Design; Machines and Equipment, Work related Musculoskeletal Disorders, Patient safety
[B] Learner's Assignment: To write an Assignment on ergonomics in different work places (ICU, CCU, Operation Theatre and Diagnostic Centre) with suitable Sketches / Layouts

Unit VI: Health Hazards   **(5 Hours)**
[A] Delivery Content: Effect of Air pollution on Lung and Eye System, Effect of Water Pollution on Gastrointestinal Track, Effect of Mobile Radiation on Brain, Effect of Noise on Ear and Brain System, Electric Shock Hazards; Causes, Symptoms and Prevention, Gross Shock, Electric Current Effect on Body (Micro and Leakage Current Shock)

[B] Learner's Assignment: Power Point Presentation / group Discussion on Adverse effects of environmental factors on Heart, Brain, Lungs, GI tract, Eyes and Ears

Text Books:
1. *R. S. Khandpur; Handbook of Biomedical Instrumentation; Third Edition, TMH Publication, 2012*
2. *Joseph J. Carr and John M. Brown; Introduction to Biomedical Equipment Technology; Fourth Edition, Pearson Education, Inc. and Dorling Kindersley Publishing Inc., New Delhi, 2012*

Reference Books:
1. *B. W. Niebel and A. Freivalds; Methods, Standards and Work Design; Tenth Edition, WCB McGraw Hill*
2. *Elaine.N. Marieb; Essentials of Human Anatomy and Physiology; Eighth Edition, Pearson Education Inc., New Delhi*
3. *Erach Bharucha; Textbook of Environmental Studies for Undergraduate Courses; First Edition, University Press(India) Private Limited, Hyderabad, 2005*

Course Outcomes:
Student will be able to-
1. Understand basic functions of human body parts and working of different systems.
2. Read and Diagnose Electrocardiograph (ECG) and Electroencephalograph (EEG).
3. Measure Blood pressure, Pulse rate and Study functioning of Pacemaker, Spiro meter, Pulse oximeter and Blood cell counter.
4. Understand and Apply the basic tenets of fundamental technologies in X-ray, Computed Tomography, Magnetic Resonance Imaging, Ultrasonic Imaging and Positron Emission Tomography.
5. Identify and Explain the principles of Anthropometry in designing work places, tools and equipments to fit the human operator.
6. Assess / Predict the effect air pollution, water pollution, mobile radiation, sound and noise pollution on health.

FF No. : 654

Course Name: Behavioral Sciences

Course Code: HS152   **Course Type: TH**

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

Unit I: Foundations of Psychology   (4 Hours)
Definition of Psychology; Historical antecedents of Psychology and trends in the 21st century, Psychology and Scientific methods; Psychology in relation to other social sciences and natural, Application of Psychology to societal problems, Various branches of Psychology and its application to society

Unit II: Development of Human Behavior   (6 Hours)
Growth and Development; Principles of Development, Personality; Definition and concept ; Role of genetic and environmental factors in determining human behavior; influence of cultural factors in socialization, Theories of personality(psychoanalytic theory, trait and type approaches), Training for personality development .

Unit III: Family Psychology   (4 Hours)
Concept of family, types of family, Significance of family on the wellbeing of an individual, Types of Conflicts and its consequences

Unit IV: Motivation and Emotion   (6 Hours)
Psychological and physiological basis of motivation and emotion; Measurement of motivation and emotion, Effects of motivation and emotion on behavior, Extrinsic and intrinsic motivation; factors influencing intrinsic motivation, Emotion competence and related issues.

Unit V: Intelligence   (4 Hours)
Concept, definition, history, Theories of Intelligence, Concept of IQ, Aptitude- concept, definition, significance, measurement

Unit VI: Learning   (6 Hours)
Concept, Definition, Components of learning, Methods of learning, Creativity-concept and process, Problem solving techniques

Text Books:
1. *Clifford T. Morgan and Richard A. King; Introduction to Psychology; 7th edition, Tata McGraw Hill Publication*
2. *Robert Feldman; Understanding Psychology; 10th edition, Tata McGraw Hill Publication*

Course Outcomes:
Students will be able to
1. Understand and apply psychological principles to personal life and will implement the concepts of Psychology in day to day life.
2. Get insight into their own personalities and develop it under the guidance of various theories.
3. Learn the methods to improve their interfamily relationships.
4. Identify the individual differences in motivation and range of emotion. And demonstrate the application self motivation and emotional regulation.
5. Differentiate between intelligence and aptitude and understand about IQ.
6. Equipped with various learning methodologies and resolve problems with a creative outlook.

FF No. : 654

Course Name: German

Course Code: HS102   **Course Type: LTH**

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

Unit I: Introduction to German   **(4 Hours)**
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.

Unit II: Food and drinks   **(5 Hours)**
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.

Unit III: Living in Germany   **(5 Hours)**
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

Unit IV: Time   **(5 Hours)**
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

Unit V: Professions and responsibilities   **(5 Hours)**
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

Unit VI: An excursion through Berlin   **(4 Hours)**
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.

List of Practicals:

Sr. No.	Description	Mode of Conduct
1.	Singing alphabet rap song to learn German alphabets. Listen and practice different sounds that alphabets make in different combinations. Spelling each other's names etc	Use of Audio, video sessions, group activities and games.
2.	Starting the dialogues with self introduction. Basic conversations. Audio sessions from book.	

3.	Practicing numbers. 0 – 1000. Practicing numbers in pairs asking each other's age, phone no. birth dates etc. Audio sessions from book.	
4.	Classroom scene enactment; "first day of the course". Audio sessions from book	
5.	Written exercises from book and work book based on first 2 topics	
6.	Games based on vocabulary related to classroom like placing right name chits on right item in the class. Audio sessions from book.	
7.	Conversations in travel about countries and languages. Audio sessions from the book. Solving exercise in work books.	
8.	Writing an essay on "my family". Reading that in class.	
9.	Picture description: theme " Types of houses, rooms and things in houses". Write description of their own house.	
10.	Writing emails and SMSs. Using time schedules given at different places, planning activities or taking appointments in formal / informal setting and cancelling it.	
11.	Practicing and enacting the telephonic conversation with friends for planning some social outing.	
12.	Practicing dialogues in pairs where you talk about the profession you are in and describe the responsibilities you have at work place. Writing an essay on an excursion.	

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.

<div align="right">FF No. : 654</div>

<div align="center">**Course Name: Japanese**</div>

Course Code: HS103   **Course Type: LTH**

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

Unit I: Orientation (Jikoushokai, Aisatsu & Moji)   **(6 Hours)**
* Theory: Orientation Lecture
* Introduction of Hiragana script with basic words
* Youon, Sokuon, Chouon – Methods of writing words
* Greetings and Classroom Expressions
* Etiquettes and mannerisms

Unit II: Introduction Of Katakana (Moji Katakana)   **(4 Hours)**
* Introduction of Katakana script
* Introduction of Katakana rules
* Katakana words used in daily life

Unit III: Calender & Numbers (Suji, Youbi, Hizuke, Jikaan)   **(4 Hours)**
* Introduction of numbers
* Writing Days of the week, Dates, Time, Months in Hiragana
* Special Greetings used in different situations in Japan

Unit IV: Basic Grammar Pattern (Bunnokatachi, Keiyoushi-To, Doushi)   **(4 Hours)**
* 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

Unit V: Introduction Of 3rd Script Kanji (Kanji & Kanji Jukugo)   **(6 Hours)**
* Basics of Kanji
* Kanji for Numbers (1-10)
* Kanji for basic words

Unit VI: Culture Of Japan (Nihon-No-Bunka)   **(4 Hours)**
* 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

List of Practical:

Sr. No.	Description	Mode of Conduct
1.	Self introduction in Japanese. Written practice of Hiragana	Games, picture cards,

	script with correct intonation and pronounciation. Native speakers CD listening.	listening cd's of native speakers dialogues, chalk and board.
2.	Practice vocab by showing picture cards. Revision test Assignment1 (Hiragana script & words).	
3.	Katakana script Renshuu. Writing own name, names of countries & some loan words from different languages In Katakana. Revision test.	
4.	Write 2nd assignment on Katakana script & words.	
5.	Oral revision of days, dates, months & time. Practice of saying birth dates, todays date & telephone nos.	
6.	Practice situational greetings. Write 3rd assignment on calendar & nos.	Games, Dialogues, General conversation, cd listening and chalk and board.
7.	Introduction to Minna no Nihongo elementary text book of Japanese language. Write sentences using different grammar articles & words. [Note:- Published by Ashwani Goyal for Goyal publishers and distributors pvt. Ltd. Delhi]	
8.	Kakitori (dictation of small passage). Learn to write self introduction in Hiragana . write 4th assignment (use of adjectives & verbs).	
9.	Write dates, days, months, years & time in Kanji. Practice nos. from 1 to 10000 in Kanji. Revision test.	
10.	Write 5th assignment on calendar in Kanji.	
11.	Japanese magazine, small film/video, listening Japanese songs for students reference and overall progress.	
12.	Preparation of End Sem/Orals. Students give PPT presentation about Japan.	

Course Outcome :

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. They become familier to fascinating country like Japan & Japanese culture.

FF No. : 654

Course Name: Samskrit

Course Code: HS104   **Course Type: LTH**

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

Unit I: **(6 Hours)**
- Samskrit as a language. (listening skills)
- Why Samskrit? Introduction to Technical aspects.
- Methods of using Samskrit as a Knowledge bank.

Unit II: **(4 Hours)**
- Sentence construction, Usage.
- Numbers, Varnas, Rules of writing.
- Complex sentences.
- Shastra, concept.

Unit III: **(4 Hours)**
- Why to speak in Samskrit?
- A language to be experienced.(Vibrations, Mantra)
- Shabda, Dhatu, Nama, Avyaya, Visheshana.

Unit IV: **(4 Hours)**
- Text, reading and explaining in simple Samskrit.
- Paragraph writing.
- Presentation.

Unit V :   **(3 Hours)**
- Comprehension.
- Tenses and Moods. (lakaraha 6)
- Sandhihi (concept

Unit VI: **(3 Hours)**
- Samasa (Concept)
- Pratyayavichar.(concept)

Text Books:
1. Dhaturoopachandrika
2. Rachananuvaadakaumudi

Activities in language lab.

1. Listen and repeat. 6 audio tracks to be completed.
2. Listen and write. 4 audio tracks to be completed.
3. Read and write. Text with 12 pages with time count.
4. Loud drills with P.P.T.
5. Speak for five minutes on any topic.
6. Question formation after listening story.
7. Speak for five minutes on given topic.
8. Games
9. Organizing exhibition for Sanskrit words related to machines and electronics.
10. Project preparations.
11. Communication sessions with unknown people.
12. A day outing with Sanskrit speakers.

Course Outcomes :

The Student will be able to:

1. Understand and experience the importance of Samskrit in Research and Development.
2. Make small sentences and express themselves in Samskrit.
3. Can read simple text.
4. Understand some grammatical concepts and use them.
5. Try to read some part of ancient text to choose some project.
6. Know simple Samskrit, they get confidence for further study

<div align="right">FF No.: 654</div>
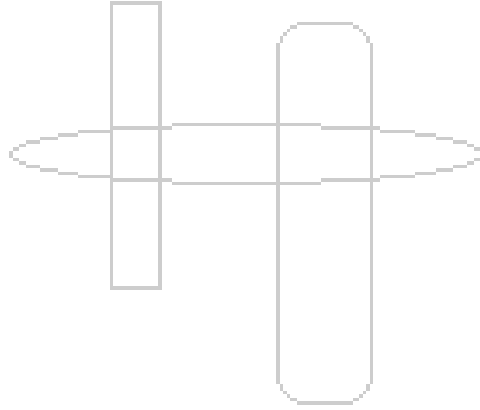
Course Name: Hardware Workshop

Course Code: EC102   **Course Type: LTH**

Credits: 2   **Teaching Scheme: Theory :1 Hours / Week**
<div align="right">Lab   :2 Hours / Week</div>

List of Practicals:

Sr. No.	Topic
1	**Basics of circuit assembly** a. Identification of basic components b. Understanding simple circuits c. Process of PCB layout using DipTrace / Eagle d. Soldering techniques
2	**PCB Assembly** a. Measurement and Testing b. Process of PCB fabrication c. Demonstration of PCB testing d. Testing of self-assembled PCBs
3	**Testing of assembled PCBs** a. Verification of different PCBs Control Panel and Admin Tools b. Fault finding c. Quality verification
4	**Enclosure Design** a. Designing a front panel, rear panel of an electronic instrument b. Heat Sink mounting, Ventilation c. Testing of self-assembled PCBs
5	**Computer assembly** a. Fixing a processor, RAM, cooling fan in a Mother Board. Fixing Mother Board in a cabinet. b. Assembling SMPS, hard disc drive, CD/DVD ROM in a cabinet. c. Connecting the cables from the SMPS to motherboard, hard disk, drives & etc. d. Establishing data connection for mother board, hard disk, drives. e. Fixing wires for power restart switches, fixing wires for power & HDD. f. LED's fixing wires for external USB and Audio Connections.
6	**Troubleshooting** a. Locate and identify the sources of hardware problems, including running tests and various other fault-finding techniques. b. Take action to correct these problems, including replacing or upgrading troublesome parts and making repairs.
7	**Introduction to Network Devices** a. Routers b. Switch c. Firewall d. Gateway, etc.
8	**Configuration of Computer Network** a. LAN setup (IP address, DNS) b. Basic networking commands (ipconfig, ping, etc) c. Accessing Remote desktop d. Cable Crimping

9	**Welding**
	a. Principle of manual metal arc welding, equipment and its operation
	b. Welding electrodes, welding joints, welding symbols
	c. Safety precautions
	d. Demonstration and one job on mild steel
10	**Sheet Metal Work**
	a. Use of marking tools and hand tools such as steel rule, marker, scissors, centre punch, measuring guage
	b. Safety precautions
	c. Demonstration and hands on experience of few operations such as marking, cutting, bending
11	**Fire Safety**
	a. Fire prevention precautions, fire extinguishers
	b. Necessity and rules of fire fighting, risk elements in fire fighting
	c. Demonstration of use of fire extinguishers

Theory:

Unit I: Electronic Components and Devices   **(2 Hours)**
Introduction to passive components like resistors, capacitors, inductors; Types of resistors, capacitors and inductors; ICs and reading datasheet; Types of switches; Types of fuses; Introduction to electronics devices like diodes, LEDs, transistors, 7 segment displays, LCD displays, buzzers, Heat Sink, Optocouplers, etc; Introduction to power devices like power transistors, MOSFET, SCR, TRIAC, IGBT and Bus Bars

Unit II: Introduction to Electronic Instruments   **(2 Hours)**
Introduction to power supplies like SMPS, fixed and variable; Functions of Digital Multi Meter; Use of IC Tester and LCRQ meter in electronics; Front panel and various controls of Signal Generator, CRO and DSO

Unit III: Soldering Techniques   **(1 Hours)**
Introduction to various soldering related tools like nose pliers, cutter, stripper, de-soldering pump, desolvik; Soldering techniques; De-soldering of components

Unit IV: Layout, Artwork and Enclosure Designing   **(1 Hours)**
Introduction to PCB Materials: paper phenollic, glass epoxy, single sided, double sided, etc; Layout software; Manufacturing process of single sided PCB; Designing a front panel, rear panel of an electronic instrument

Unit V: Computer Assembly   **(2 Hours)**
Introduction to basic computer peripherals, Main memory: RAM, ROM, bit, byte, word; Processor: Processor speed/cores, Arithmetic unit, Control Unit; Input-output devices: Keyboard, display, disk, internal and external storage devices, hard disc drive, external USB; Network: Address, Control and Data bus

Unit VI: Troubleshooting   **(1 Hours)**
Introduction to basic troubleshooting issues in computer

Unit VII: Introduction To Network Devices   **(1 Hours)**
Introduction to network: LAN, WAN, WWW; Network Devices: Routers, switch, firewall, gateway, protocol, etc.

Unit VIII: Configuration of Computer Network   **(2 Hours)**

Networking terms: Client-server architecture, IP address, Domain Name Server (DNS), URL, crimping; Security: user account and access control, captcha, etc

Text Books:
1. *Patil Mahesh, Basic Electronic Devices and Circuits, New Delhi, PHI Learning*
2. *Kalsi H S, Electronic Instrumentation, second edition, New Delhi, Tata McGraw Hill, 2004/2008*
3. *Sen Gupta R, Principles of Reliable Soldering Techniques, New Age International Publications, 1997*
4. *Ez-Route: Software for Electronics Schematic and Pcb L, Adv Micro-system Corp, Florida, Adv Micro-system Inc.*
5. *Sinha P K, Sinha Priti, Computer Fundamentals, fourth edition, New Delhi, BPB Publications, 2010.*
6. *Sloan M E, Computer Hardware and Organization, second edition, New Delhi Galgotia Publications, 1992*
7. *Radhakrishnan M, Balsubramanian D, Computer Installation and Troubleshooting, New Delhi, Indian Society for Technical Education*

Reference Books:
1. *Floyd Thomas L., Electronic Devices, sixth edition, New Delhi, Pearson Education, 2006*
2. *Khandpur R S, Troubleshooting Electronic Equipments Includes Repair and Maintenance, second edition, New Delhi, Tata McGraw Hill, 2003*
3. *Govindarajalu B, Computer Architecture and Organization: Design Principles and Applications, New Delhi, Tata McGraw Hill, 2004*
4. *Hamacher V C, Vranesic Zvonko, Zaky Safwat G., Computer Organization, second edition, Newyork, McGraw Hill, 1989*
5. *Curt Simmons, Dalan David, A+ Technicians on the Job, New Delhi Tata McGraw Hill*
6. *Andrew Tanenbaum, Computer Networks, third edition, Pearson Education, India, 1993*
7. *Forouzanbehrouz A, Data Communications and Networking, second edition, New Delhi, Tata McGraw Hill, 2000*
8. *S. K. Harja Chudhary, Elements of Workshop Technology, Media Promoters and Publishers Pvt. Ltd.*
9. *K. T. Kulkarni Introduction to Industrial Safety,*

 Course Outcomes:
Students will be able to
1. Identify the basic electronic components and instruments
2. Prepare and test PCB
3. Study computer organization and troubleshooting issues
4. Explain computer networking fundamentals
5. Perform welding and sheet metal work following safety practices

FF No.: 654

Course Name: Soft Skills

Course Code: HS153   **Course Type: LTH**

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

Unit I: Introduction to soft skills and self analysis   (2 Hours)
- Goal setting and career planning: dreams and goals; Short term, medium and long term goals. Setting SMART goals
- Introduction and meaning of soft skills; difference between soft skills and hard skills, importance of soft skills in corporate world, Concepts of IQ, EQ and SQ
- Influence of cultural differences on soft skills
- Self analysis. Knowing yourself; birth dates, height, weight, etc.
- SWOT (activity based explanation)

Unit II:Communication skills and listening skills   (2 Hours)
- 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, Importance of non-verbal communication.
- Public speaking meaning ,do's and don'ts

Unit III: Listening skills   (2 Hours)
- Meaning, difference between listening and hearing, process of listening
- Types: active, passive, evaluative, discriminative listening, intuitive, selective, pretence
- Barriers in listening. Physical barriers, People related barriers (Physiological barriers, Psychological barriers), Tips for being a good listener

Unit IV: Team building and leadership   (3 Hours)
- Team building and leadership, Introduction to leadership skills.
- 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. Difference between a leader and manager.

Unit V: Time management and problem solving   (3 Hours)
- Creativity and problem solving, Introduction to problem solving concepts and techniques.
- Time management (Concept and importance), Abstract thinking and critical thinking.(Out of the box thinking)

Unit VI: Professional etiquettes   (1 Hours)
- Etiquettes and manners: meaning and significance, Attitude, organizational ethics
- Telephonic etiquettes, table manners, professional etiquettes, hygiene and clothing manners.

List of Practicals:

Sr. No.	Description	Mode of Conduct
1.	Breaking the ice. Interaction with students with their introduction session and discussing their future plans.	Use of Audio, video sessions,

	Demonstration and open discussions about cultural differences in soft skills	demonstrations, group activities and games, scene enactments.
2.	Start with a small session of meditation where they are asked to focus on self, likes, dislikes, etc. Then ask to do SWOT test. Then again discuss their dreams and goals to align with their SWOT analysis.	
3.	Asking the students to introduce themselves in the class and then explaining them importance of short and crisp introduction along with some examples.	
4.	Role play to elaborate on the importance of communication skills and explain the students the dos and don'ts for good and effective communication.	
5.	Students will be given a topic to prepare at home which they will be discussing or briefing in the class.	
6.	Some exercises based on reading and listening will be discussed and solved in the class.	
7.	Students will be given some topics related to latest issues for which they will be given some preparation time; they will work in groups and discuss the same in the group (group discussion).	
8.	Video session. In this session students will be shown a film on team building and then they will discuss based on the topic.	
9.	Group activity like making maximum paper planes, where students have to exhibit their leadership qualities, team building skills and effective team playing as well.	
10.	The teacher will identify some business problems which the students have to solve looking at the present scenario and the concept of problem solving and creativity.	
11.	Video of Mr D.S.Kulkarni to be shown in the class and discussed ask students to get some more examples of people who have come far away in their lives.	
12.	A game or an activity related to manners, etiquettes and hygiene.	

Text Books:
1. *Soft Skills by Dr. K Alex. S.Chand and company ltd.*

Course Outcomes:
The student will be able to –
1. Set his / her goals for future and start preparing accordingly.
2. Apply proper communication skills and hence enable him to be an effective communicator.
3. Become a good listener and perform his / her tasks as per expectations.
4. Lead a team successfully and work as a good team player as well.
5. Apply creativity and time management skills to solve problems related to work.
6. Demonstrate professional etiquettes in a workplace.

Course Name: Foundation Mathematics

Course Code: ES107   **Course Type: AU**

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

Unit I Basic Set Theory and Logic   **(5 Hours)**
Sets and their representations, Subsets , Power set, Universal set, Venn diagrams, Algebra of Sets ,Set Identities, Computer representation of Set.

Unit II Basic Probablity   **(5 Hours)**
Factorial n (n!), Permutations and combinations, Random experiments: outcomes, sample spaces (set representation) Events, exhaustive events, mutually exclusive events, Axiomatic definition of Probability, Conditional Probability, Bayes Theorem.

Unit III Differentiation and Integration   **(5 Hours)**
Elementary functions and their graphs, Inverse functions, Limit, Continuity, Derivative and its geometrical significance, Maxima and Minima, revision of methods of integration

Unit IV Trigonometric functions   **(4 Hours)**
Measurement of angles, trigonometric ratios, standard identities, trigonometric functions, Differentiation and integration of trigonometric functions.

Unit V Complex numbers   **(5 Hours)**
Complex numbers as ordered pairs, Argand's diagram, Triangle inequality, De Moiver's Theorem, Hyperbolic functions.

Unit VI Matrices and Determinants   **(4 Hours)**
Algebra of matrices, Determinants and their properties, Inverse of a matrix, Cramer's rule, basic vector algebra

Text Books:
1. B. S. Grewal ,'Higher Engineering Mathematics',40th Edition, Khanna Publications.

Reference Books:
1. Richard Johnsonbaugh ,'Discrete Mathematics',5th Edition, Pearson Education Asia
2. Bernard Kolman, Robert Busby, Sharon Ross ,' Discrete Mathematical Structures' ,3rd Edition,Prentice Hall India Pvt. Ltd.

Course Outcomes:
The student will be able to –
1. Apply the knowledge of set theoretic notations and basic concepts of logic.
2. Identify and use of basic probability concepts ,matrices and vectors.
3. Formulate logical statements, solve problems on trigonometry, limit, continuity.
4. Demonstrate the knowledge of complex numbers, hyperbolic functions
5. Solve problems on matrices, determinants, derivatives and integration.

FF No.: 654

Course Name: English

Course Code: HS101   **Course Type: AU**

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

Unit I: Vocabulary   **(4 Hours)**
- Word Formation
- Correct Usage
- Idiomatic Expressions

Unit II: Basic Grammar   **(6 Hours)**
- Articles
- Parts of Speech
- Sentence Structure
- Verbs and Concord
- Question tags
- short responses

Unit III: Listening Skills   **(4 Hours)**
- Kinds of Sentences
- Verbs Modals
- Conjunctions

Unit IV: Speaking Skills   **(6 Hours)**
- Direct and Indirect speech
- Description
- Narration
- Conversation

Unit V: Reading Skills   **(4 Hours)**
- Active Passive Voice
- Prepositions
- Improved Spelling

Unit VI: Writing Skills   **(6 Hours)**
- Paragraph Writing
- Punctuation
- Note-making

List of Practicals:

Sr. No.	Description	Mode of Conduct
1.	Self- Introduction	
2.	Review a film clipping	
3.	Guess the word, Telephonic Conversations	
4.	Dumb Charades	
5.	Dialogues, Situational conversation, Relay conversation.	Use of Audio, video

6.	Analyse a newspaper article	sessions, demonstrations, group activities and games, scene enactments.
7.	Spot the error, clues.	
8.	Newspaper articles, Reports, Editorials.	
9.	Picture Composition	
10.	Paragraph Writing	
11.	Group Activity-follow instructions, enacting.	
12.	Crossword Puzzles, Scramble	
13.	Memory Games.	
14.	Chinese Whispers, Follow Instructions	

Text Books:
1. *Wren and Martin, "English Grammer and Composition" S. Chand Publications*

Reference Books:
1. *Bansal and Harrison- Spoken English in India*
2. *Essentials of Grammar and Composition*
3. *Lewis- The New Roget's Thesaurus in Dictionary Form*
4. *Oxford English for Careers:Engineering 1 Student's Book. Oxford University Press*

Course Outcomes:
The student will be able to –
1. Enhance their vocabulary skills
2. Construct and use grammatically correct sentences.
3. Develop good listening skills.
4. Speak confidently in English.
5. To be able to comprehend the printed content
6. Write appropriately to communicate effectively

FF No.: 654

Course Name: Environmental Science

Course Code: HS155   **Course Type: AU**

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

Unit I: Renewable and Non-renewable Resources   **(05 Hours)**
Definition, scope, importance and multidisciplinary Nature of Environmental Studies. Definition and types of resources based on different heads, Natural resources and associated problems, role of an individual in conservation of natural resources, equitable use of resources in achieving sustainable development.

Unit II : Ecosystems   **(05 Hours)**
Concept of an Ecosystem, Structure and Function of various components of an Ecosystem, Energy Flow in an Ecosystem, Ecological Succession, Ecological Pyramids for different types of Ecosystems, food chain, food web, interdependency of components of ecosystem over each other.

Unit III: Biodiversity and its conservation   **(05 Hours)**
Introduction, Definition, genetic, species and ecosystem diversity, Biogeographical classification of India, Value of Biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation.

Unit IV: Environmental Pollution   **(05 Hours)**
Definition of Pollution, various terms related to pollution, types of pollution, pollutants, types of pollutants, causes, effects and remedial measures of different types of pollution, role of an individual to prevent the pollution.

Unit V: Disaster and Hazardous Waste Management   **(05 Hours)**
Disaster management: floods, earthquakes, cyclones and landslides. Integrated solid waste management, 3R principle, hazardous waste management, biomedical waste treatment technologies and disposal options, e-waste management, waste minimization for sustainability, waste management – Indian scenario.

Unit VI: Social Issues and Environment   **(05 Hours)**
Urban problems related to energy, Water conservation, environmental ethics, wasteland reclamation, consumerism and waste products, EIA, Environment and human health, Human rights, value education, Public awareness, Role of modern technology.

Text Books:
1. *Erich Bharucha;Textbook of Environmental Studies for Undergraduate Courses,Second Edition,UGC Publications.*
2. *Mackenzie L. Davis and David A. Cornwell.2010. Introduction to Environmental Engineering, 4e. Tata McGraw-Hill Education Private Limited New Delhi.*

Reference Books:
1. *Gilbert M. Masters.2007. Introduction to Environmental Engineering and Science, 2e. Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Delhi.*
2. *J. Glynn Henry and Gary W. Heinke.2004. Environmental Science and Engineering, 2e. Pearson Education (Singapore) Pte. Ltd.*

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.

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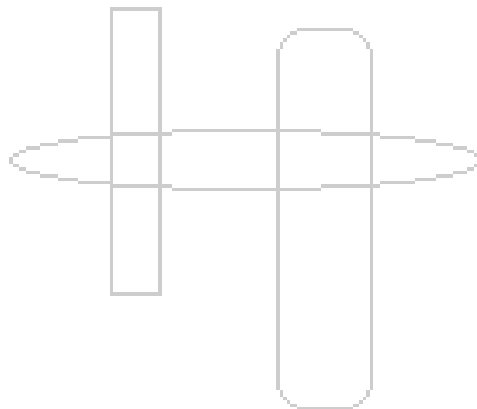
Course Name: Software Workshop

Course Code: CS102   **Course Type: LTH**

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

List of Practical:

Sr. No.	Topic
1	**Installation and Configuration of Operating system** a. Disk partitioning (Dual boot) b. Linux operating system installation and configuration c. Basic unix commands
2	**Software Installations** a. Device drivers b. Anti-virus software c. Patching
3	**System Administration** a. Account Management b. Control Panel and Admin Tools c. Computer Management GUI tool
4	**Disk Administration** a. Disk Formatting b. Disk Defragmentation c. File and directory layout d. File permissions
5	**Introduction to MATLAB** a. Installation b. Basic commands c. Predefined libraries d. Introduction to Simulink
6	**Introduction to SCILAB** a. Installation b. Basic commands c. Predefined libraries
7	**Introduction to Circuit Simulation Software** a. Installation b. Simulation of simple circuits
8	**Introduction to LaTeX** a. Installation b. Basic commands c. Writing mathematical equations d. Scripting Tags
9	**Introduction to Carpentry** a. Introduction b. Use of marking tools and hand tools such as marking gauge, try square, steel rule, saws, jackplane, chisels, power tools etc. c. Safety precautions. d. Demonstration & One job involving different operations such as sawing, planning, chiseling, etc.

10	**Introduction to Fitting** a. Introduction b. 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. c. Safety precautions. d. Demonstration & hands on experience of few operations such as sawing, filling drilling etc.

Theory:

Unit I: Installation and Configuration of Operating system   (2 Hours)
Introduction to Linux operating system; basic commands of Unix; Disk Partitioning

Unit II: Software Installations   (3 Hours)
Types of software: Application software, system software (device drivers, etc); Levels of programming language: Machine, Assembly, High level language; Software evolution: Procedure oriented, Object oriented, Rule Based, Applicative language (Event driven); Compilation model (Linker, loader, compiler, interpreter); Types of Virus and role of anti-virus software; plagiarism checker; Patching; Key-terms: Open source, free and paid software

Unit III: System Administration   (1 Hours)
Account Management; Introduction to Control Panel and Admin Tools; Computer Management GUI tool

Unit IV: Disk Administration   (1 Hours)
Disk Formatting; Disk Defragmentation; File and directory layout; File permissions

Unit V: Introduction to MATLAB   (2 Hours)
Introduction; application development; working environment; handling graphics; libraries and tool boxes; Introduction to Simulink

Unit VI: Introduction to SCILAB   (1 Hours)
Introduction; application development; working environment; equivalent operations

Unit VII: Introduction to Circuit Simulation Software   (2 Hours)
Introduction; circuit development; working environment; Simulation of simple circuits

Unit VIII: Introduction to LaTeX   (2 Hours)
Introduction; Basic commands; writing mathematical equations; Scripting Tags

Text Books:

1. *Pratap Rudra, Getting started with MATLAB: A Quick Introduction for Scientist and Engineers, version 7.8, New Delhi, Oxford University press, 2015.*
2. *Devid Baez Lopez, Felix E Guerrero-castro, Circuit Analysis with MultiSim, Morgan and Claypool Publishers, 2011.*
3. *Lamport Leslie, Document Preparation System LATEX: User's Guide and Reference Manual, New Delhi, Pearson Education, 2006.*
4. *Volkerding P, Reichard K, Johnson E F, LINUX: Configuration and Installation, BPB Publications, 1997*
5. *Jaiswal A, Fundamentals of Computers and Information Technology, New Delhi, Dream Tech Press, 2003*

6. *S.k. Hajra Chudhary. Elements of Workshop Technology, Media Promoters and Publishers Pvt., Ltd.*
7. *K.T. Kulkarni. Introduction to Industrial Safet, K.T. Kulkarni. Pune.*
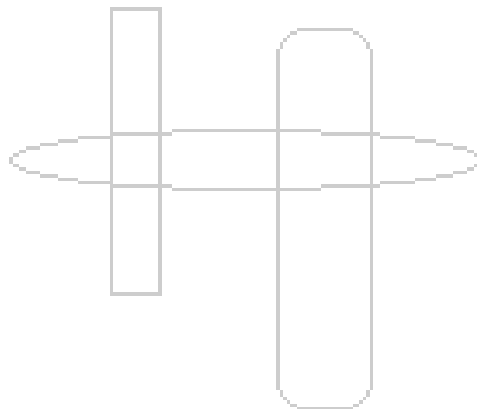
Reference Books:
1. *Komerinski M F, Collett C, LINUX System Administration Handbook, Eddison Wisley, 1999*
2. *Kemp Juliet, LINUX System Administration Recipes, Apress Inc, USA, 2009*
3. *Frisch Ellen,Essential System Administration, Navi Mumbai Shroff Publishers and distributors, 2003.*
4. *Hwaiyu 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. Understand basics of operating system and software evolution.
2. Know system administration
3. Write simple programs for data processing
4. Use software for simulation of electronic circuits
5. Organize documents effectively
6. Perform few Carpentry & Fitting operations
7. Follow Safety practices

FF No.: 654

Course Name: General Seminar

Course Code: HS154   **Course Type: L**

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

Unit I: Formal Written skills   (2 Hours)
- Office Drafting- Circulars ,Notice ,Memos.
- Job application with resume /CV
- Covering Letters for resume/ CV
- Business correspondence- Enquiry, Order letter, Complaint letter, Adjustment letter.
- Report writing.

Unit II: Public speaking   (2 Hours)
- Mastering the ABCs of public speaking.
- Speech preparation.
- Public speaking meaning ,do's and don'ts
- How to be an effective public speaker.

Unit III: Presentations.   (2 Hours)
- Guidelines for a successful presentation.
- Effective Power point design using visual aids.
- Practicing delivery of presentation.

Unit IV: Project literature survey   (3 Hours)
- Guidelines for a literature survey.
- Difference between Literature survey and field survey.
- Making a literature survey.

Unit V: Group Discussion   (3 Hours)
- Introduction and meaning of group discussion.
- Essential elements of group discussion.
- Skills required /Initiation/ Techniques
- Movement and gestures to be avoided.
- Non verbal communication in group discussion.

Unit VI: Interview Techniques   (1 Hour)
- How to present well in Interviews.
- Basic tips and how to search a job effectively.
- Telephonic interviews.
- Dress code/typical questions/Interview mistakes.

List of Practical:

Sr. No.	Description	Mode of Conduct
1.	Practice of application writing, reports, memos, circulars and assignments to be conducted.	
2.	Extempore to be taken in class and each student to be given a topic to speak on the same.	

3.	Topics to be allotted to students and with guidance of teacher making the presentation in class.	
4.	A mini project assigned in groups and elaborating the literature survey of the given topic.	Use of Audio, video sessions, demonstrations, group activities and games, scene enactments.
5.	Students will be given a topic to prepare at home which they will be discussing or briefing in the class.	
6.	Public speaking topics to be discussed and students will be encouraged to participate in class.	
7.	Students will be given some topics related to latest issues for which they will be given some preparation time; they will work in groups and discuss the same in the group (group discussion).	
8.	Group discussion on a topic of their choice in which the coordination and leadership qualities of the student will be evaluated.	
9.	Various topic related activities will be conducted in class.	
10.	Mock interviews will be conducted and each and every student shall be evaluated during class.	
11.	Different videos,motivational speeches, inspirational guidance and knowledge will be imparted to the students.	
12.	Games and topic related activities will be conducted and every students participation will be encouraged.	

Text Books:
1. Dr .K .Alex, Soft skills, S.Chand & Company Ltd.

Course Outcomes:
The student will able to
1. Gain confidence and will be able to face interviews.
2. Able to make professional presentations and reports.
3. Learn to be a Team member and cooperate .
4. Lead a team successfully and work as a good team player as well.
5. Will be able to stand out in a crowd with the skills provided.
6. Will be a thorough Professional with the above training provided.

Annexure I
List of General Proficiency Courses offered to F.Y. B.Tech. AY 2016-17

For Detail Syllabus Kindly refer GP course booklet

Course Code	Name of Course
GP101	Aerobics
GP102	Bharatnatyam
GP103	Chess
GP104	Drawing and Painting
GP105	Flute
GP106	Guitar
GP107	Harmonium
GP108	Photography
GP109	Tabla
GP110	Taekwondo
GP111	Vocal
GP112	Yoga and Pranayam
GP113	Ayurved
GP114	Constitution of India
GP115	Film Appreciation
GP116	Fundamentals of Banking
GP118	Homeopathy
GP119	Life Style management
GP120	Nutrition and Fitness
GP121	Shares and Stock