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-17'
F. Y. B. Tech. (MCIP Group)
Effective from Academic Year 2017-18

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 MCIP Group: Core Module Semester I and Semester II   **FF No. 653**

Course Code	Course Type	Course Name	Th. Hrs.	Lab Hrs.	Project Hrs.	Hrs. / Week	Credits	ISA (100 marks converted to 30 in case of THL and TH courses)			MSE (100 marks converted to 35) Unit 1-3	ESE (100 marks converted to 35) Unit 4-6
								CA	MSE	ESE		
Common for Semester I and Semester II (Note: * - Only in Semester I and # - Only in Semester II : for all ECIT and MCIP Students)												
ES153THL	THL	Applied Mechanics	3	2	0	5	4	30	35	35	100	100
ES103THL	THL	Electrical Engineering	3	2	0	5	4	30	35	35	100	100
ME152THL	THL	Engineering Graphics	3	2	0	5	4	30	35	35	100	100
ES101TH / ES102TH	TH	Calculus*/ Linear Algebra$^#$	3	0	0	3	3	30	35	35	100	100
ME151TH	TH	Thermodynamics	2	0	0	2	2	30	35	35	100	100
HS151TH	TH	Indian Philosophy and Ethics	2	0	0	2	2	30	35	35	--	--
GP1XXL	L	General Proficiency	0	2	0	2	1	30	35	35	--	--
Common Total			**16**	**8**	**0**	**24**	**20**	--	--	--	--	--
Courses to be offered in Semester I only												
ME153L	L	Manufacturing Workshop	0	2	0	2	1	30	35	35	--	--
ES157AU	AU	Fundamental Mathematics						30	35	35	--	--
HS101AU	AU	English	2	0	0	2	0	30	35	35		
HS155AU	AU	Environmental Science						30	35	35	--	--
Grand Total (Semester I)			**18**	**10**	**0**	**28**	**21**	--	--	--	--	--
Courses to be offered in Semester II only												
ME154L	L	Machining Workshop	0	2	0	2	1	30	35	35	--	--
ES108L	L	Mini Project	0	0	4	4	2	30	35	35	--	--
Grand Total (Semester II)			**16**	**10**	**4**	**30**	**23**	--	--	--	--	--

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

Course Code	Course Type	Course Name	Th. Hrs.	Lab Hrs.	Project Hrs.	Hrs. / Week	Credits	CA	MSE	ESE	MSE (100 marks converted to 35) Unit 1-3	ESE (100 marks converted to 35) Unit 4-6
								ISA (100 marks converted to 30 in case of THL and TH courses)				
Common for Semester I and Semester II (Note: * - Only in Semester I and # - Only in Semester II : for all ECIT and MCIP Students)												
ES156THL	THL	Engineering Physics	3	2	0	5	4	30	35	35	100	100
ES101TH / ES102TH	TH	Calculus* / Linear Algebra#	3	0	0	3	3	30	35	35	100	100
CS151THL	TH	Fundamentals of Programming	2	2	0	4	3	30	35	35	100	100
ES154THL	TH	Applied Chemistry	2	2	0	4	3	30	35	35	100	100
EC151TH	TH	Electronics Technology	2	0	0	2	2	30	35	35	100	100
HS152TH	TH	Behavioral Sciences	2	0	0	2	2	30	35	35	--	--
HS1XXTH	TH	International Language	2	0	0	2	2	30	35	35	--	--
HS153L	L	Soft Skills and Seminar	0	2	0	2	1	30	35	35	--	--
Common Total			**16**	**8**	**0**	**24**	**20**	--	--	--	--	--
Courses to be offered in Semester I only												
ME153L	L	Manufacturing Workshop	0	2	0	2	1	30	35	35	--	--
ES157AU	AU	Fundamental Mathematics						30	35	35	--	--
HS101AU	AU	English	2	0	0	2	0	30	35	35		
HS155AU	AU	Environmental Science						30	35	35	--	--
Grand Total (Semester I)			**18**	**10**	**0**	**28**	**21**	--	--	--	--	--
Courses to be offered in Semester II only												
ME154L	L	Machining Workshop	0	2	0	2	1	30	35	35	--	--
ES108L	L	Mini Project	0	0	4	4	2	30	35	35	--	--
Grand Total (Semester II)			**16**	**10**	**4**	**30**	**23**	--	--	--	--	--

Course Name: Applied Mechanics

Course Code: ES153THL   **Course Type: THL**

Credits: 4   **Teaching Scheme: Theory   : 03 Hours / Week**
                                                         Lab/Project   : 02Hours / Week

Unit 1: Basics of Mechanics: **(7 Hours)**
Types of Mechanics, historical development, Fundamental concepts (Length, mass, time, Force, concentrated force, surface forces, body forces, internal and external force, push and pull force, Action and Reaction, Tension and Compression force, weight, idealization as a particle and rigid body), six fundamental principles of mechanics(Newton's 3 laws of motion, Law of gravitation, Law of Parellogram, Principle of transmissibility), SI units, prefixes & their conversions, Vector operations, scope of study, Various force systems.
Coplanar Force System: Skew resolution and composition of force, Rectangular resolution and composition of force, resultant of concurrent force system, equilibrium of a particle, free body diagram of particle, Use of lamis theorem. Moment of force, Principle of moments/Varignon's theorem, couple & its properties, Conversion of force in to force & couple, equivalent force couple system,

Unit 2: Non-coplanar Force System: **(6 Hours)**
Rectangular components of a force, co-ordinate direction angles, direction cosines, unit vector, addition of vectors, position vector, Force defined by its magnitude and two points on its line of action, application of dot product, Resultant and equilibrium of concurrent force system, cross product, Moment of force about a point & about an axis, Resultant and equilibrium of parallel force systems.

Unit 3: Equilibrium: **(7 Hours)**
Conditions of equilibrium in coplanar and non coplanar force system, types of supports and support reaction ,types of loading, Free body diagram, support reactions of determinate beams (simply supported, cantilever, overhang, compound), equilibrium of two force body & equilibrium of three force body, equilibrium of parallel and general forces in plane

Unit 4: Distributed Forces: **(6 Hours)**
Centroid: concept of center of mass, center of gravity & centroid, use of Varignon's theorem of moment, application of standard formulae to find centroid of composite plates and wires,
Moments of Inertia: Concept & its significance, parallel & perpendicular axis theorems, polar moments of inertia, radius of gyration, application of standard formulae to find M.I. of simple and composite areas.

Unit 5: Analysis of Structures: **(8 Hours)**
Plane truss: Concept of plane and space truss, two force and multi force member, perfect, imperfect, deficient, redundant plane truss, assumptions in analysis of truss, method of joints ,zero force member, method of section
Frames: Analysis of plane frames
Friction: concept of friction, Coulomb's laws of dry friction, limiting force of friction, coefficient of friction, angle of friction, angle of repose, cone of friction, variation of frictional force for various conditions (no friction, no motion, impending motion and motion conditions),Wedge friction,

problems on dry friction(with no impending motion, impending motion at all points of contact, impending motion at some point of contact).

Unit 6: Kinematics Of particles: (6 Hours)
Rectilinear motion:
Definition of motion, types of motion (plane, space, translation, rotation, general plane 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, Numericals on variable acceleration. Graphical solution of rectilinear motion, and other graphical methods

Curvilinear motion:
Motion along plane curved path, Concept of of position, displacement, distance, speed, average & instantaneous velocity and acceleration, curvature, radius of curvature, point of inflextion.

Application to find velocity and acceleration in three systems: rectangular coordinate (x-y), normal and tangential (n-t), radial and transverse (r-θ).

List of Practical's / Activities:

| Sr. No.	Practical/Activity
A	Set A : Experiments (4 turns)
1	Equilibrium of coplanar concurrent force system. OR Application of law of moment using bell crank leaver/ F- frame.
2	Equilibrium of concurrent space force system
3	Equilibrium of parallel space force system
4	To find support reaction in (i) simple beams (ii) compound beams.
B	Set B : Project based Activity (7 turns)
5	Project based Activity:- ANY ONE (from a to i) *Student will do exercises related to the subject in a small group (of 3 to 5 students),* *Student has to complete course project on ideas concern to the subject but not limited to.*
a	Making of one working model based on concept or problems / mechanism from any unit along with its validation of results/measurements
b	Modeling of physical system using laws of mechanics/Design new experiment in engineering mechanics
c	Poster presentation and Seminar
d	Preparation of question bank with solutions (Match the pairs).
e	Animation of mechanisms/computer program to solve numerical
f	Development of 60 minutes video lecture on any one topic from syllabus
g	Completion of one **MOOC** (massive open online course) along with its certification, in engineering mechanics
h	Writing and publishing one research paper in the field of engineering mechanics
i	Development of any one **virtual experiment** in mechanics of materials

Text Books:
1. *R. C. Hibbeler; Engineering Mechanics Statics & Dynamics, Pearson Publication,12 th edition*

2. *F. P. Beer and E. R. Johnston; Vector Mechanics for Engineers Statics & Dynamics- 9th edition, Tata McGraw-Hill Publications.*
3. *J. L. Meriam, L. G. Kraige; Engineering Mechanics Statics & Dynamics - 5th edition, John Wiley & Sons, Inc. 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 to determine unknowns.
4. Determine the centroid and second moment of area of simple and composite lamina.
5. Analyze co-planar systems of forces to determine the forces in members of trusses, frames and assemblies including friction.
6. Analysis of motion of the particle along rectilinear and curved path

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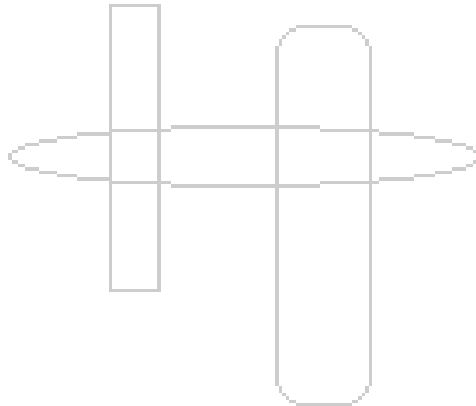
Course Name: Electrical Engineering

Course Code: ES103THL   **Course Type: THL**

Credits: 4   **Teaching Scheme: Theory   : 03 Hours / Week**
                                  Lab   : 02 Hours / Week

Unit 1: DC circuits   **(7 Hours)**
Ohms law, Kirchhoff's laws, Source transformation, and Network reduction using series- parallel and Star-Delta transformations, Superposition theorem,Thevenin's theorem, Norton's theorem, Maximum power transfer theorem. Numerical based on above.

Unit 2: AC Circuits 1   **(7 Hours)**
AC fundamentals – standard expression of AC quantity, Average value, RMS value, Peak factor, Form factor, concept of phasor, R-L-C series circuits, Concept of active, reactive and apparent power, power factor. Numericals based on above.

Unit 3: AC Circuits 2   **(6 Hours)**
AC parallel circuits, Three Phase balanced AC circuits, phase sequence, concept of line and phase values of Star-Delta connections, Concept of Neutral, Earth. Numericals based on above.

Unit 4: Transformers   **(6 Hours)**
Construction, working principle, emf equation of single phase transformer, transformation ratio, concept of ideal and practical transformer. constant flux operation, equivalent circuit, losses, regulation, efficiency at various loads. Numericals based on above.

Unit 5: DC Motors   **(7 Hours)**
Construction, working principle, emf equation, types, concept of back emf, torque equations, motor characteristics, different starters, Numericals based on above. C.T. and P.T, ferrite core transformer.

Unit 6: Induction Motors   **(7 Hours)**
Three phase induction motor, classification, construction, RMF, working principle, standstill and running condition, torque equation, T-s characteristic, maximum torque, slip ring and squirrel cage type, starters, applications. Numericals based on above.

List of Practicals:

1. Load test on 1 phase transformers.
2. Load test on d.c. shunt motor.
3. Numerical practice on Unit 1
4. Speed control of d.c. shunt motor.
5. Three phase star and delta circuit.
6.   Numerical practice on Unit 2
7. Load test on three phase induction motor.
8. Numerical practice on Unit 3,4
9. 9.(A)Study -of A.C. motor starter

9.(B) Study-Introduction to electrical component.

9.(C) Study-Lab Assignment : Electrical bill study

9.(D) Study-Substation visit.

9.(E)Study of D.C. motor starter.

10. Numerical practice on Unit 5,6

Text Books:

1. *Electrical Technology-Edward Hughes.*
2. *Electrical Technology- B.L.Theraja Vol-2.*
3. *Electrical Technology –H.Cotton.*

Reference Books:

1. *Electric Machinery,TMH(Sixth Edition)-Fitzgerald.*
2. *Electrical Machines, Drive and power system, Pearson education-Theodore Wildi.*
3. *Kothari D. P and Nagrath IJ, "Basic Electrical Engineering", Second edition, Tata McGraw - Hill, 2009.*
4. *Electrical Machines and transformers- Irving Kosow.*
5. *V.K.Metha, Rohit Metha, "Basic Electrical Engineering", Fifth edition, S.Chand & Co, 2012.*

Course Outcomes:

The student will be able to –

1. Understand different theorems and able to solve numerical on it.
2. Understand concept of single phase and three phase a.c. circuit.
3. Understand AC circuit three phase circuits.
4. Find regulation and efficiency of single phase transformer.
5. Understand construction and working of DC machines and solve numerical problems.
6. Understand construction and working of induction motor and the T-S characteristic.

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Course Name: Engineering Graphics

Course Code: ME152THL   **Course Type: THL**

Credits: 4   **Teaching Scheme: Theory   : 03 Hours / Week**
                                                        Lab   : 02 Hours / Week

Unit 1: Orthographic Projections   **(8 Hours)**
Reference Planes, Types and Methods of projections with symbols, Projections of various objects, various types of sectional views

Unit 2: Isometric Drawing   **(8 Hours)**
Types of pictorial projections, isometric Projections and Isometric views, Construction of Isometric views from given orthographic views.

Unit 3: Projections of points and lines   **(7 Hours)**
Projections of points in various quadrants, Projections of lines inclined to both reference planes (lines in first quadrant only), locating traces of lines.

Unit 4: Projections of planes   **(6 Hours)**
Projections of planes inclined to both reference planes. Projections using auxiliary planes,Finding true shapes

Unit 5: Projections of Solids   **(6 Hours)**
Classification of solids, Projections of solids such as Prism, Pyramid, Cylinder, Cone, Cube, and tetrahedron inclined to both reference planes

Unit 6: Development of Lateral Surfaces   **(5 Hours)**
Development of Lateral Surfaces of cones and pyramids - concept, methods, applications

List of Practical:
1. **Introduction to Lines, Lettering and Dimensioning**
   Demonstration of various drawing tools, Learning and using BIS standards of lettering, lines, dimensioning

2. **Orthographic Projections**
   Draw orthographic and sectional orthographic projections of machine components.

3. **Isometric Drawing**
   Isometric drawings of various solids and simple machine components

4. **Computer aided drafting with AUTO CAD**
   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 objects manually and with the help of AutoCAD software.
3. Visualize the object, draw isometric views manually and 3D objects using CATIA.
4. To plot the projection of lines and planes.
5. To draw the projections of solids and sections of solids.
6. To develop lateral surfaces of solids and interpret conventions used in drawing.

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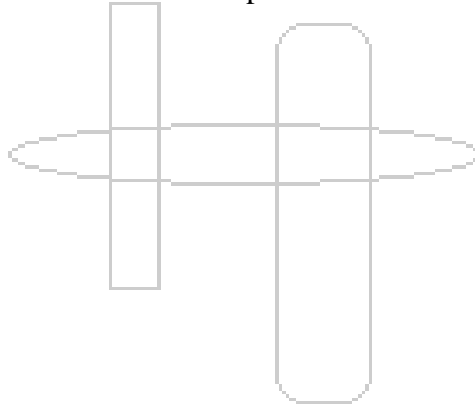
Course Name: Calculus

Course Code: ES101TH   **Course Type: TH**

Credits: 3   **Teaching Scheme: Theory   : 03 Hours / Week**

Unit 1: Functions of single variable   **(6 Hours)**
Expansions of functions: Taylor's & Maclaurin's series, Curves (Cartesian, Polar and parametric standard curves) in 2D.

Unit 2: Functions of two or more variables   **(8 Hours)**
Introduction to functions of two or more variables, Level surfaces, limits and continuity, Partial derivatives, chain rules, derivative of implicit function. Homogeneous functions, Euler's theorem, Jacobian, maxima and minima of functions of two variables, Method of Lagrange's multipliers.

Unit 3: Double Integration   **(6 Hours)**
Beta and Gamma function, Introduction to Cartesian and polar curves, Evaluation of double integrals, change of order.

Unit 4: Triple Integration   **(8 Hours)**
Evaluation of double integral using Jacobian transformation, Co-ordinate systems in 3 Dimensions, Standard surfaces, Evaluation of triple integrals, Dirichlet's integral, change of variables

Unit 5: Vector Differentiation   **(6 Hours)**
Scalar and Vector point functions, tangential and normal components of velocity and acceleration, gradient, directional derivative, divergence and curl.

Unit 6: Vector Integration   **(6 Hours)**
Line integral, work done, conservative vector field, Surface integral, Theorem of Green, Stokes and Gauss.

Text Books:
1. *Thomas G. B. and Finney, 'Calculus and analytic Geometry', 11th Edition,Pearson Publications*
2. *Ron Larson and Bruce H. Edwards, 'Text book of Calculus', Brooke/Cole, a part of Cengage Learning (Indian Edition), (c) 2011.*

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

Course Outcomes:
The student will be able to –
1. Acquire the knowledge of Taylor series, partial derivatives, multiple integral, Beta and Gamma function, curve tracing, vector differentiation, vector integration

2. Use properties of functions of several variables, beta and gamma functions, partial derivative, use of Jacobian transformation
3. Demonstrate the knowledge of chain rules, implicit functions and change of order of integration
4. Recognize and identify curves and surfaces, homogeneous functions, change of variables in triple integral, problems on Gauss divergence theorem, problems on Stoke's theorem.
5. Interpret the properties of vector differentiation and integration
6. Apply the knowledge of series expansions of functions, partial derivative, multiple integral, vector differentiation and integration

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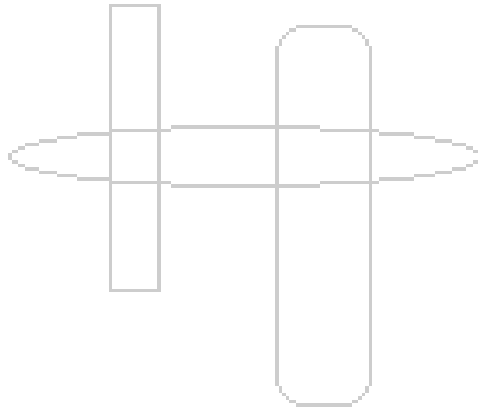
Course Name: Linear Algebra

Course Code: ES102TH   **Course Type: TH**

Credits: 3   **Teaching Scheme: Theory   : 03 Hours / Week**

Unit 1: System of Linear Equations   **(7 Hours)**
Rank of matrix, Elementary Matrices, System of linear equations, Gauss-Jordan Elimination. Applications of System of Linear equations.

Unit 2. Vector Spaces   **(7 Hours)**
Euclidean Vector space, Vector Space, Subspace, Span of a set, Spanning Set, Fundamental Subspaces, Linear Dependence, Independence, Basis and dimension of a vector space.

Unit 3. Inner Product of Vector Spaces   **(7 Hours)**
Inner product Spaces, Orthogonal Bases: Gram Schmidt Process, Mathematical Models and Least Squares Analysis.

Unit 4. Linear Transformations   **(7 Hours)**
Introduction to linear transformations, Matrices for Linear Transformation, Orthogonal Transformation, Geometric properties of linear operators on R^2 and R^3.

Unit 5. Eigen Values and Eigen Vectors   **(7 Hours)**
Eigen Values and Eigen Vectors of a matrix, Diagonalization, Symmetric Matrices and Orthogonal Diagonalization, Quadratic forms and its Applications.

Unit 6. Complex Numbers   **(7 Hours)**
Complex numbers and its Various forms, Geometrical Meaning of complex numbers, De Moivre's Theorem, Roots of the complex numbers, Introduction to functions of complex variable: Circular and Hyperbolic Functions, Logarithm functions, Separation of real and imaginary parts.

Text Books:
1. *Ron Larson and David C. Falvo, ' Linear Algebra An Introduction',1st Edition, Cengage Learning (Indian Edition).*
2. *B.V.Ramana, 'Higher Engineering Mathemtics' Tata McGraw-Hill publishing co. Ltd.*

Reference Books:
1. *David C. Lay, 'Linear Algebra and its Applications', 3rd Edition, Pearson.*
2. *Gilbert Starng, 'Linear Algebra and its Applications', 4th Edition, Cengage Learning.*
3. *Erwin Kreyszig, 'Advanced Engineering Mathematics'10th Edition, Dec. 2010, , John Wiley and sons, Inc*

Course Outcomes:
The student will be able to –
1. Acquire the concepts of linear algebra and Complex numbers
2. Relate matrices to linear transformations and interpret geometrically
3. Demonstrate the knowledge of linear dependence/independence, Basis and Dimension, hyperbolic functions.

4. Recognize the concepts of spanning set, basis, dimension linear transformation, inner product, orthogonal transformation
5. *Set up and solve system of linear equations, orthogonal basis using Gram-Schmidt Process.*
6. *Apply the knowledge to solve problems on least square, Quadratic forms, roots of the polynomial equations.*

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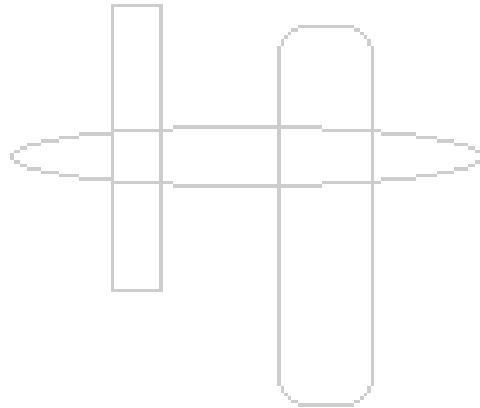
Course Name: Thermodynamics

Course Code: ME151TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory   : 02 Hours / Week**

Unit 1: Fundamentals of thermodynamics   **(4 Hours)**
Thermodynamic systems, properties, processes, concept of continuum, macro and microscopic approach, reversible and irreversible processes, Principle of conservation of Mass and Energy, temperature and temperature scale, zeroth law of thermodynamics, Temperature scale numerical.

Unit 2: First Law of Thermodynamics and steady flow energy Equations   **(6 Hours)**
Thermodynamic Work, Heat, First law of thermodynamics, Joules experiment, perpetual motion machine I, Limitations of first law of thermodynamics, Application of first law to flow processes, concept of internal energy, flow energy and enthalpy, application of steady flow energy equation to nozzles, turbines, compressors, heat exchanger etc.

Unit 3: Ideal Gas Properties and Processes   **(4 Hours)**
Ideal gas properties, equations of state, constant pressure, constant volume, isothermal, adiabatic, polytropic and throttling processes on p-v diagram, heat transfer, work transfer, change in internal energy and enthalpy during these processes.

Unit 4: Properties of Pure substances   **(5 Hours)**
Formation of steam using T-h, p-v plots and p-v-T surface, properties of steam, use of steam tables, dryness fraction and its determination.

Unit 5: Vapour Processes   **(4 Hours)**
Various vapour processes - change of properties, work and heat transfer, p-v plots.

Unit 6: Introduction to Power Cycles   **(5 Hours)**
Carnot cycle, Rankine cycle, comparison of Carnot cycle and Rankine cycle, Brayton cycle, comparison between Brayton cycle and Rankine cycle, actual vapour cycles, Characteristics of an ideal working fluid, efficiencies in steam power plant, an overview of reciprocating engines.

Text Books:
1. R. K. Rajput, Engineering Thermodynamics, Laxmi Publications.
2. P. K. Nag, Engineering Thermodynamics, fourth edition, Tata McGraw Hill Publications.

Reference Books:
1. Y. Cengel & Boles: Thermodynamics – An Engineering Approach, Tata McGraw Hill Publications.
2. P. L Ballany: Thermal Engineering, Khanna Publishers.
3. C.P. Arora: Engineering Thermodynamics, Tata McGraw Hill Publications.

Course Outcomes:
The student will be able to –
1. Understand fundamental concepts of thermodynamics.
2. Understand and apply First law of thermodynamics to basic engineering problems.

3. Learn thermodynamic properties and analyze various ideal gas processes.
4. Analyze steam properties using steam table.
5. Understand and analyze various vapour processes.
6. Understand basic power cycles and their comparisons.

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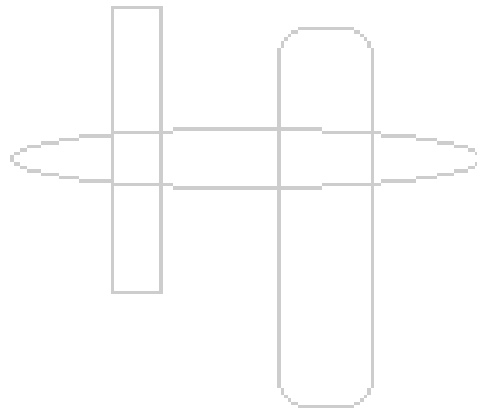
Course Name: Indian Philosophy and Ethics

Course Code: HS151TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory   : 02 Hours / Week**

Unit 1:Introduction & The Philosophy of Logic and Reasoning (Nyaya)   (6 Hours)
Introduction to "The Six Systems of Indian Philosophy of Ancient India". The Philosophy of Logic and Reasoning (Nyaya). Sources of Valid Knowledge with their merits and de-merits. Importance of Testimony and the Logic presented to argue for the sake of a creator v/s the argument presented against one. The various objects of knowedge (Prameya)

Unit 2: 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 3: 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 4: 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 5 : Elevation through performance of duty (Karma Mimamsa)   (04 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 6: 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.

FF No. : 654

Course Name: Engineering Physics
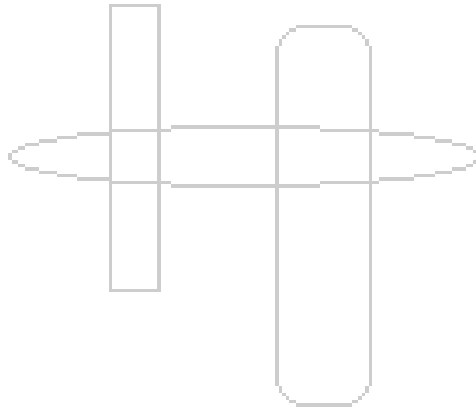
Course Code: ES156THL **Course Type: THL**

Credits: 4 **Teaching Scheme: Theory : 03 Hours / Week**
Lab/Project : 02Hours / Week

Unit 1: Mechanical Waves **(7 Hours)**
Oscillations and Waves: Simple Harmonic Motion, Simple Pendulum and Torsional Pendulum, Free, Damped, Forced and Coupled oscillations,
Sound and Acoustics: Characteristics of sound (Speed, Pitch, Timbre, Loudness), Weber Fechner Law, Sound Intensity (Decibel) and Pressure Level, Echo, Beats, Reverberation, Sabine's Formula (Qualitative), Sound absorption and absorbent materials, Building acoustics,
Ultrasonics: Ultrasonic wave production (Piezo electric and Magnetostriction method), Properties of ultrasonic waves, Detection of ultrasonic waves (Acoustic Grating, Piezo-electric), Applications: Ultrasonic cleaning, Elastic constant measurement, SONAR, Non destructive testing etc.

Unit 2: Optics **(7 Hours)**
Interference: Coherence, Thin film interference, Fringe width (wedge shaped film), Colours in thin films, Newton's rings and it's applications, Michelson's interferometer and it's applications, General applications: Optically flat surface, Antireflection coatings, Interference filters etc.
Diffraction: Fresnel and Fraunhofer diffraction, Single slit Fraunhofer diffraction (Qualitative), diffraction grating (Qualitative), Dispersive power, Rayleigh's criterion, Resolving power of grating and telescope,
Polarization: Brewster's law, Malus law, Double refraction (Huygen's theory), Retarders, Quarter and half wave plate, circular and elliptical polarization (Qualitative), Applications: Polaroid goggles and 3D – Movies, Liquid Crystal Display (LCD),

Unit 3: Quantum Mechanics **(6 Hours)**
Matter Waves: Revision to 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, Braggs law, Phase velocity, Group velocity (Qualitative), Heisenberg's uncertainty principle, Single slit electron diffraction, Applications of uncertainty principle,
Wave Equations: Wave function (ψ), Max Born's interpretation, Physical significance of ψ and ψ^2, Schrödinger's wave equations (Qualitative), Applications: 1 D - Infinite potential well, Finite potential well (Qualitative), Tunneling effect, Scanning Tunneling Microscope,

Unit 4: Semiconductor Physics **(7 Hours)**
Semiconductors: Quantum numbers, Band Theory of Solids, Energy Bands in C (Graphite, Diamond), Si, Ge, Sn, Ohm's Law (Microscopic), 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, Photovoltaic Effect, Solar Cell Working and Characteristics,
Introductory Nanotechnology: Nanomaterials, Nanoparticles Properties (Quantum Size Effects: optical, electrical, magnetic, structural, mechanical), Zero, One, Two Dimensional Nanostructures,

Nanomaterial Synthesis Techniques (Physical, Chemical etc.), Applications: Energy, Space, Electronics, Defense, Textile, Cosmetics, Medical, Environment, Automobiles,

Unit 5: LASERS and Nuclear Physics (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, Carbon Dioxide Laser (Principle, Construction and Working), Applications of Lasers (Industry : Drilling, Welding and Micromachining, Medical: Laser Eye, Skin, Cosmetic Surgery, Communication: Fiber Optics, Military Applications: Laser range detection, Laser Guided Missiles),
Nuclear Physics: Nuclear constituents, Atomic Mass Unit, Mass Defect, Binding Energy, Binding Energy Curve, Nuclear Fission, Q-value of Nuclear Reaction, Chain reaction, Nuclear Fusion, Distinction between Nuclear Fission and Fusion, Controlled Fusion, Ignition Temperature, Lawson's Criteria, Fusion Reactors, Confinement Schemes: Gravitational, Magnetic, Inertial, Laser Fusion Reactor,

Unit 6: 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,

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.	Simple pendulum and coupled pendulum	
	Determination of speed of ultrasonic waves in water and to determine the compressibility of liquid using Ultrasonic Interferometer	
	Measurement of sound pressure level and absorption coefficient of sound of different materials	
2.	Determination of wavelength of light / radius of curvature of plano-convex lens using Newton's ring experiment	Any one of two / three to be performed by students and other for demonstration of working principle.
	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	
3.	Polarization by Refraction: Malus Law	
	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	
4.	Determination of band gap of a semiconductor.	
	Hall Effect, determination of Hall coefficient.	
5.	Characteristics of solar cell, calculation of fill factor.	
	Determination of wavelength and thickness of wire using LASER and determination of beam divergence of LASER.	
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	Torsional oscillations in different liquids	http://vlab.amrita.edu/?sub=1&brch=74
2	Kundt's Tube Apparatus	http://vlab.amrita.edu/?sub=1&brch=201&sim=853&cnt=7
3	Ultrasonic Interferometer	http://vlab.amrita.edu/?sub=1&brch=201&sim=803&cnt=1
4	Newton's Rings-Wavelength of light	http://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1
5	Newton's Rings-Refractive index of liquid	http://vlab.amrita.edu/?sub=1&brch=189&sim=1520&cnt=1
6	Michelson's Interferometer- Refractive index of glass plate	http://vlab.amrita.edu/?sub=1&brch=189&sim=1519&cnt=1
7	Michelson's Interferometer- Wavelength of laser beam	http://vlab.amrita.edu/?sub=1&brch=189&sim=1106&cnt=1
8	Diffraction Grating	http://vlab.amrita.edu/?sub=1&brch=281&sim=334&cnt=1
9	Brewsters Angle determination	http://vlab.amrita.edu/?sub=1&brch=189&sim=333&cnt=1
10	Emission spectra	http://vlab.amrita.edu/?sub=1&brch=195&sim=359&cnt=1
11	Photoelectric effect	http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1
12	Determination of Planck's Constant	http://vlab.amrita.edu/?sub=1&brch=195&sim=547&cnt=1
13	Hall effect experiment:- Determination of charge carrier density	http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1
14	Solar Panel Experiment (Remote Trigger)	http://vlab.amrita.edu/?sub=1&brch=195&sim=360&cnt=1

15	Laser beam divergence and spot size	http://vlab.amrita.edu/?sub=1&brch=189&sim=342&cnt=1
16	B-H Curve	http://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=1
17	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. Derive, distinguish, analyze, elucidate and solve problems from the topics of Oscillations, Sound waves and Ultrasonics and experiment (e.g. pendulum, oscillations, ultrasonics etc.)
2. Distinguish, analyze, determine the physical terms from thin film interference, diffraction, polarization and to measure experimentally (e.g. radius of curvature, spectral resolution, Brewster's angle etc.)
3. Recognize, justify, and 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, nano-materials and interpret their applications.
5. Differentiate, correlate, interpret the working mechanism and applications of different lasers (He-Ne laser, Ruby laser etc.) experiment on lasers and distinguish, analyze, justify the concepts from Nuclear Physics (Fission, Fusion etc.) solve the problems on binding energy, fusion etc.
6. Analyze, interpret, distinguish, calculate and solve the basic problems for magnetic materials (magnetization, hysteresis) and superconductivity (e.g. critical temperature, penetration depth etc.) and elucidate their applications.

FF No. : 654

Course Name: Fundamental of programming

Course Code: CS151THL   **Course Type: THL**

Credits: 3   **Teaching Scheme: Theory   : 02 Hours / Week**
                                    Lab   : 02Hours / Week

Unit 1: Introduction to programming   (2 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 2: Flow of Control   (5 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 3: Array and Srings   (6 Hours)
Arrays: Definition, syntax, element operations, memory representation, initialization. Two dimensional array, row and column major;
Applications of arrays: sorting, searching and matrix operations;
Strings: Introduction, Array of characters, output, input, character string constant, Accepting multiword string

Unit 4: Functions and pointers   (4 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
Pointers: Definition, syntax, address of operator, pointer variables, relevance of data type in pointer variables, dereferencing operator, Pointer to pointer, address arithmetic;

Unit 5: Structures   (5 Hours)
Structure: Need, User-defined Data Types, Derived Data Types ,Definition, syntax, declaration and initialization, structure variables, accessing and assigning values to structure variables, "dot" operator, "size of" operator, functions and structures, arrays of structures, nested structures, pointers and structures, passing structure to a function and returning structure from function.

Unit 6: File Handling in C   (2 Hours)
File types, File opening modes, File handling I/O – fprintf, fscanf, fwrite, fread, fseek. File pointers. Implementing basic file operations in C.

List of practical

Sr. No.	Topic
1	Graphics: Drawing basic diagrams using Simple Cpp
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, Reversing n digit number , marks display program, find min/max Generate roll numbers
5	Linear and Binary Search
6	Bubble sort, Insertion and Selection Sort
7	Matrix arithmetic
8	Assignment on functions – menu driven , Calculate factorial, generating progressions, GCD, LCM using recursion programs, etc
9	Create Structures for student result, employee payroll, library book issuing
10	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 with C- Schaum's outline Series, B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7*
2. *C By Example, Kalicharan Noel, UK, Cambridge University Press*
3. *C How to Program, Deitel H N, Deitel P J, third edition, New Delhi, Prentice Hall of India, 2002*

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. Construct derived data type for real world entities.
5. Implement programming constructs to solve real world problems
6. Apply file handling for permanent storage of data

FF No. : 654

Course Name: Applied Chemistry

Course Code: ES154THL   **Course Type: THL**

Credits: 3   **Teaching Scheme: Theory   : 02 Hours / Week**
Lab   : 02 Hours / Week

Unit 1: Water   **(6 Hours)**
Introduction, Chemical Analysis of Water – Hardness; Temporary and Permanent, Alkalinity; Hydroxide, Carbonate and Bicarbonate, Softening Methods – Zeolite or Permutit Process, Ion Exchange or Deionization or Demineralization Process, Water Purification by Reverse Osmosis, Water Filtration by Electro dialysis, Numerical on water Treatment - Zeolite Process, Hardness Determination and Alkalinity Calculation

Unit 2: Separation Techniques   **(4 Hours)**
Introduction, Principle, Types and Classification of Chromatographic Techniques, Thin Layer Chromatography – Principle, Theory, Working and Applications, Paper Chromatography – Principle, Theory, Working and Applications, Column Chromatography (Passing Reference),   High Performance Liquid Chromatography – Principle, Theory of HPLC, Instrumentation and Working, Applications of HPLC, Gas Chromatography – Principle, Theory of GC, Instrumentation, Working and Applications of GC

Unit 3: Corrosion   **(4 Hours)**
Mechanism of corrosion: Wet (Hydrogen evolution and Oxygen absorption), Methods of prevention of corrosion, cathodic protection, Anodic protection, Surface Conversion Coatings (Metallic – Electroplating by Hot Dipping), Factors affecting rate of corrosion

Unit 4: Molecular Spectroscopy   **(6 Hours)**
Law of Absorption - Lambert's Law and Beer's Law, Integrated Equation, Principle, Theory, Instrumentation and Working of Ultra Violet - Visible Spectrophotometer, Applications of UV – Vis Spectroscopy, Woodward Fieser Rules for Calculating λ_{max} in Conjugated Dienes and   α, β - Unsaturated Carbonyl Compounds - Problems, Principle, Theory, Instrumentation and Working of Infra-Red Spectrophotometer, Applications of IR Spectroscopy, Principle, Theory, Instrumentation and Working of Nuclear Magnetic Resonance Spectrophotometer, Applications of NMR Spectroscopy, Problems

Unit 5: Fuel and Combustion   **(4 Hours)**
Types of calorific value, Proximate analysis of coal, Ultimate analysis of coal, Numerical on analysis of coal, Refining of petroleum, Combustion- Theoretical Air requirement, Theoretical Oxygen Requirement of solid fuels, Theoretical Oxygen Requirement of Liquid /Gaseous fuels, Numerical on combustion

Unit 6: Alloys   **(4 Hours)**
Introduction, Types / Classification of Alloys, Alloys of Copper (Brass, Bronze and Gun metal), Properties and methods of preparation of Alloys

List of Practical:
One Experiment on each unit and Course Project (In a group of maximum four students)
1. Determination of total hardness by EDTA method.
2. Determination of alkalinity of water.
3. Separation of mixture of ortho and para nitro aniline by Thin Layer Chromatography.
4. Separation and identification of components of mixture by paper chromatography.
5. Separation and identification of metal ions from binary mixture of cations using column chromatography.
6. Demonstration of IEC, HPLC and GC Chromatograms.
7. Estimation of rate of corrosion of galvanized iron plates in acidic and basic medium.
8. Application of nickel coating on copper metal using electroplating method.
9. Experimental verification of Beer-Lambert's law by determining unknown concentration of solution of ferric ammonium sulphate using colorimeter.
10. Determination of ash and moisture from coal (Proximate Analysis).
11. Estimation of Copper from brass iodometrically.

Text Books:
1. *Dr. Sunita Rattan; A Textbook of Engineering Chemistry; Third Edition, S. K. Kataria & Sons, New Delhi, 2012*
2. *P.C. Jain and Dr. Monika Jain; Engineering Chemistry; Sixteenth Edition, Dhanpat Rai Publishing Company(P) Ltd., New Delhi, 2013*
3. *Dr. Sunita Rattan, Experiments in Applied Chemistry; Third Edition, S. K. Kataria & Sons, New Delhi, 2012*
4. *S. K. Bhasin and Sudha Rani; Laboratory Manual on Engineering Chemistry; Third Edition, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2012*

Reference Books:
1. *A. K. De; Environmental Chemistry; Eighth Edition, John Wiley and Inc., 1999*
2. *D. A. Skoog and J. J. Leary; Principles of Instrumental Analysis; Fourth Edition, Saunders College Publishing, 1992*
3. *A.K.Shaha; Combustion Engineering and Fuel Technology; Edition Oxford & IBH Publishing Company*
4. *Svehla G. and Sivasankar B.; Vogel's Quantitative Inorganic Analysis; Seventh Edition, Pearson Education, 2012*
5. *J. Mendham and R. C. Denney and J. D. Barnes and M. J. K. Thomas; Vogel's Text Book of Quantitative Chemical Analysis; Sixth Edition, Pearson Education Limited, 2012*

Course Outcomes:
The student will be able to –
1. Analyze, treat and determine the impurities in domestic and industrial waste water.
2. Understand the basics of different chromatographic techniques Separate and identify the components in the given mixture from retardation / retention factor.
3. Suggest suitable mechanism for prevention of corrosion of metal and compare the rate of corrosion of metal in acidic and basic media.
4. Apply the principles of different spectroscopic methods and find out the unknown concentration of given solution of complex compound by Colorimetery**.**
5. Apply appropriate logic, Solve problems and arrive at solution based on water treatment, spectroscopic principles, grading of fuels (from the results of proximate analysis).
6. Suggest suitable method of preparation of alloys and estimate copper from brass iodometrically.

FF No. : 654

Course Name: Electronics Technology

Course Code: ES151TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory   : 02 Hours / Week**

Unit 1: Semiconductor Devices   **(5 Hours)**
Diode, Zener diode, BJT–Symbol, Structure, Characteristics and Types

Unit 2: Digital Electronics   **(5 Hours)**
Boolean algebra, De-Morgan's Theorem, Concepts of K-Maps; Logic gates and Truth table

Unit 3: Integrated Circuits   **(5 Hours)**
Concept of IC; Types of ICs, Package type of ICs, Basics of Op-Amp, 555 timer IC.

Unit 4: Analog Communication   **(5 Hours)**
Communication system, Need for modulation, Types of modulation–AM, FM and PM; Block diagram of transmitter and receiver

Unit 5: Filters   **(5 Hours)**
Concept of Filters, Classification of filters– Passive and Active, AF and RF, Analog and Digital; Circuits for Passive filters

Unit 6: Applications of Electronic Circuits   **(5 Hours)**
Application of diode as rectifier; Application of Transistor as an amplifier; Applications of Op-Amp– comparator and Differentiator; AM Modulator Circuit

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

Reference Books:
1. Electronic Circuits, Analysis and Design by Donald A.Neamen,Tata-Mc Graw Hill Education pvt.ltd.
2. Modern Digital Electronics by R.P.Jain,Tata-Mc Graw Hill Education pvt.ltd
3. Electronics Devices and Circuits by J.B.Gupta, S.K.Katariaand Sons Publishing Company.
4. Digital Logic: Applications and Design,John M.Yarbrough 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 and BJT.
2. Illustrate digital circuits using logic gates.
3. Elaborate concepts of integrated circuits.
4. Describe the need of analog modulation techniques.
5. Classifythe filters.
6. Discuss the applications of electronic circuits.

FF No. : 654

Course Name: Behavioral Sciences

Course Code: HS152TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory   : 02 Hours / Week**

Unit 1: Title of the Unit: Foundations of Psychology   **(4 Hours)**
Definition and goals of Psychology, Scientific methods – Laboratory Experiment, Field work, Archival research, survey, Interview, Application of Psychology - Educational Psychology, Social Psychology, Developmental psychology, Health/clinical Psychology

Unit 2: Title of the Unit: Development of Human Behavior   **(6 Hours)**
 Personality Development: Nature and Nurture,Theories - Erikson , Big Five (Trait), Measurement – Projective techniques (Rorschach, TAT), Personality Inventories, Application : Family Psychology

Unit 3: Title of the Unit: Cognition   **(4 Hours)**
Perception, Attention, basic concepts of Psychophysics, Memory and forgetting : Models and theories, Application : Educational Psychology

Unit 4: Title of the Unit: Motivation   **(6 Hours)**
Definition of Motivation and the motivational cycle, Theories of Motivation : Drive, Incentive, McClelland, Maslow, Frustration and conflict : Sources and Types, Application : Industrial Psychology

Unit 5: Title of the Unit: Intelligence   **(4 Hours)**
Definition, measurement and Theories of Intelligence, Concept and models of EQ, Application : Testing and Counseling

Unit 6: Title of the Unit: Individual and Group behavior   **(6 Hours)**
Group behaviour: Compliance, Conformity, Theories of attraction, Love and relationships, Anti-social behaviour: causes and remedies, Application : Social, Consumer and Criminal Psychology

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: HS102TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory : 02 Hours/ Week**

Unit 1: 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
Cities and countries. Nationalities and languages.
Grammar: Personal pronouns. Conjugations of weak verbs.

Unit 2: Friends Collogues Professions and responsibilities   **(6 Hours)**
Introducing various professions, Different professions and professional life .Responsibilities at the workplace. Small Passages and Dialogues related to that. Classroom related objects
Numbers. 1-1000. Tell and understand telephone numbers. Dates.
Grammar: Conjugation of verbs sein and haben (to be and to have), Singular and Plural form of nouns. Definite articles.

Unit 3: In the city   **(4 Hours)**
Places in Germany, Vocabulary related to different places in the city like Railway station , Museum, Busstop etc. Directions and telling location. Family and relationships.
Grammar: Indefinate Articles, Negation, Strong Verb, Imperative

Unit 4: Food and drinks   **(4 Hours)**
Starting conversations. Meeting in Cafes. Vacbularay for food and drinks. Ordering food and paying the bill.
Grammar: Nominative, Akkusative, Verbs associated with Nom and Akk. Forming and answering Wh questions. Introducation of Modal Verb möchten

Unit 5:Time   **(5 Hours)**
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. Separable verbs, Modal verbs müssen, können, wöllen

Unit 6: Hobbies, Journey, Trip, Excursion   **(3 Hours)**
Hobbies and free time activities. Journey, small trips
Mode of transport for the same .
Grammar: Akkusative, Prapositions of Akkusative Introduction of Dativ, ordinal numbers

Unit 7: Living in Germany   **(4 Hours)**
Types of Houses , Types of Rooms, Description of rooms.Vocabulary of Furniture in the house.
Grammar: Adjectives, Opposites, Wechsel Prapositions

Text Books:
1. *Netzwerk Deutsch als Fremdsprache A1* by *Stefanie Dengler*

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. Introduce himself or herself
2. Say, write numbers, number names. Recognize professions of male and female. Play dialogs related to classroom object. Recognize definite articles of classroom objects. Recognize Singular/Plural form.
3. Tell directions, locations. Write passage on Family and professions, ages of family members. Write, formulate negation sentences. To give orders, make polite requests using Imperative.
4. Make conversation related to Restaurant, Cafes using Accusative and Modal verb (möchten)
5. Read and tell clock time and use it for taking and cancelling formal/ informal appointments using Possessive pronouns, Separable verbs and Modal verbs.
6. Read and understand small texts about Hobbies, free-time activities and read and write ordinal number, date of birth and important days, holidays in year. Recognize and use Accusative prepositions
7. Describe various types of houses and furniture items in various rooms of a house

FF No. : 654
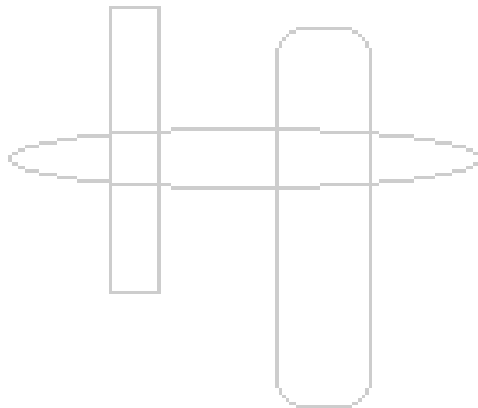
Course Name: French

Course Code: HS105TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory : 02 Hours/ Week**

Unit 1: Introduction   **(4 Hours)**
Alphabets, Numbers (0-100), Months, days of the week, Difference between Tu/Vous, Self Introduction, Date of birth, Telephone numbers, Basic salutations.

Unit 2 Ecole de francais, Paris: Au secrétariat   **(6 Hours)**
Indefinite Articles (c'est ce sont) Definite Articles, Introduction of third person, Nationalities, professions, Irregular verbs –Etre / Avoir.

Unit 3: Autour de l'école   **(4Hours)**
Vocabulary related to family and colours, Regular « er » ending verbs, Prepositons, Directions.

Unit 4: La vie quotidienne   **(6 Hours)**
Quelle heure est- il?, Verbs « aller, venir, faire », Interrogation (yes /no), Reflexive verbs.

Unit 5: Ma chambre   **(6 Hours)**
Vocabulary for room and house, Regular "ir" ending verbs, Concept of si, oui and non, Les adjectifs possessifs.

Unit6: Une Randonnée   **(4 Hours)**
La négation, Concept of Jouer a/jouer de.

Text Books:
1. Manjiri Khandekar and Roopa Luktuke; JUMELAGE;Saraswati House Pvt Ltd.

Course Outcomes:
The student will be able to –
1. Greet formally as well as informally and introduce himself or herself in French, Read and write numbers, dates, telephone numbers, days of the week.
2. Describe the culture of France and form grammatically correct sentences and introduce third person.
3. Ask or tell the directions to reach the destination and describe your family.
4. Tell and ask time, frame basic questions and describe your routine.
5. Write emails, letters and small essays in French and describe your room using relevant vocabulary.
6. Make negative sentences and use them in the dialogues.

FF No. : 654

Course Name: Japanese

Course Code: HS103TH   **Course Type: TH**

Credits: 2   **Teaching Scheme: Theory: 02 Hours/ Week**

Unit 1: 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 2: Introduction Of Katakana (Moji Katakana)   **(4 Hours)**
- Introduction of Katakana script
- Introduction of Katakana rules
- Katakana words used in daily life

Unit 3: 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 4: 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 5: Introduction Of 3rd Script Kanji (Kanji & Kanji   Jukugo)   **(6 Hours)**
- Basics of Kanji
- Kanji for Numbers (1-10)
- Kanji for basic words

Unit 6: 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

Text Books:
1. *Nihongo Shoho; Japanese Language Teachers Association pune; April 1994.*
2. *Minnano Nihongo; Goyal Publisher; 2012*

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., and days of the week, months, year, and 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 familiar to fascinating country like Japan & Japanese culture.
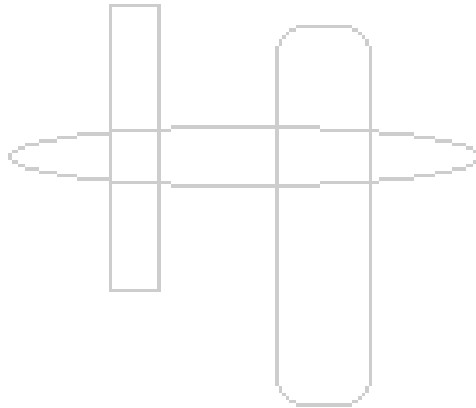
Course Name: Soft Skills and Seminar

Course Code: HS153L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours/ Week**

Unit 1: Introduction to soft skills and writing skills   **(4 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, SWOT (activity based explanation), Application, email, Report (Informal) writing.

Unit 2: Professional etiquettes   **(4 Hours)**
Etiquettes and manners: meaning and significance, Attitude, organizational ethics, Telephonic etiquettes, table manners, professional etiquettes, hygiene and clothing manners.

Unit 3: Communication skills   **(6 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(Keep It Short and Simple), Importance of non-verbal communication. Public speaking meaning, do's and don'ts

Unit 4: Listening skills   **(4 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 5: Team building   **(6 Hours)**
Team building and leadership, Concept of team: difference between team and group, process of team building, significance and methods to develop team spirit, Characteristics of a leader. Walk the talk.

Unit 6: Time management and Group discussion   **(6 Hours)**
Time management (Concept and importance), Techniques and rules and regulations during GD, Do's and don'ts in GD.

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 use writing skills for formal documents.
2. demonstrate professional etiquettes in a workplace
3. Apply proper communication skills and hence enable him to be an effective communicator.
4. Become a good listener and perform his / her tasks as per expectations.
5. Lead a team successfully and work as a good team player as well.
6. Apply time management skills and participate in group discussions.

FF No. : 654

Course Name: Manufacturing Workshop

Course Code: ME153L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: Carpentry
Introduction, Use of marking tools and hand tools such as marking gauge, try squares, steel rules, saws, jack plane, chisels etc. Use of power tools, Safety precautions. Demonstration and one job involving different operations such as sawing, planning and chiseling etc.

Unit 2: Welding
Introduction, Principle of manual metal arc welding, equipment and its operation, welding electrodes, welding joints, welding symbols, safety precautions, demonstration and one job on mild steel

Unit 3: Mini Project
Besides the above jobs students in groups will make an article / gadget / model / setup in involving the work of above work trades and / or other work trades.

Text Books:
1. *S. K. Harja Chudhary, Elements of Workshop Technology, Media Promoters and Publishers Pvt. Ltd.*
2. *K. T. Kulkarni Introduction to Industrial Safety,*

Reference Books:
1. *H. Geng, Manufacturing Engineering Hand Book, McGraw Hill Publishing Co.Ltd..*
2. *L. E. Doyle, Manufacturing Processes and Materials for Engineering, Prentice Hall Inc.,*

Course Outcome:
The student will be able to
1. Perform few carpentary and welding operations
2. Follow safety practices

Course Name: Fundamental Mathematics

Course Code: ES157AU   **Course Type: AU**

Credits: Audit   **Teaching Scheme: Theory   : 02 Hours / Week**

Unit 1:   Functions, Limits and continuity   **(4 Hours)**
Elementary functions and their graphs, Inverse functions, Limits, Continuity.

Unit 2: Derivative   **(4 Hours)**
Derivative and its geometrical significance, Maxima and Minima, and Mean value theorems.

Unit 3: Integration   **(4 Hours)**
Integration as the inverse process of differentiation. Integration by parts and by substitution.

Unit 4: Definite integral   **(4 Hours)**
Definite integral, properties, evaluation and its applications.

Unit 5: First order differential equation   **(4 Hours)**
Order, degree, types of solution, Formation of differential equations, methods of solving.

Unit 6: Complex numbers   **(4 Hours)**
Complex numbers as ordered pairs, Argand's diagram, De Moiver's Theorem, Hyperbolic functions.

Text Books
1. *Ron Larson and Bruce H. Edwards, 'Text book of Calculus', Brooke/Cole, a part of Cengage Learning (Indian Edition), (c) 2011.*
2. *Thomas G. B. and Finney, 'Calculus and analytic Geometry', 11th Edition,Pearson Publications*

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

Course Outcomes:
The students will be able to
1. Identify and graph the elementary function and their limits
2. find derivative, maxima and minima of functions
3. apply the basic rules of integration
4. solve the problems on definite integral
5. set up and solve the differential equations
6. analyze complex numbers and its geometry

FF No. : 654

Course Name: English

Course Code: HS101AU   **Course Type: AU**

Credits: Audit   **Teaching Scheme: Theory   : 02 Hours / Week**

Unit 1. Vocabulary   **(4 Hours)**
- Word Formation
- Correct Usage
- Idiomatic Expressions

Unit 2. Basic Grammar   **(6 Hours)**
- Articles
- Parts of Speech
- Sentence Structure
- Verbs and Concord
- Question tags
- short responses

Unit 3.: Listening Skills   **(4 Hours)**
- Kinds of Sentences
- Verbs Modals
- Conjunctions

Unit 4. Speaking Skills   **(6 Hours)**
- Direct and Indirect speech
- Description
- Narration
- Conversation

Unit 5. Reading Skills   **(4 Hours)**
- Active Passive Voice
- Prepositions
- Improved Spelling

Unit 6. Writing Skills   **(6 Hours)**
- Paragraph Writing
- Punctuation
- Note-making
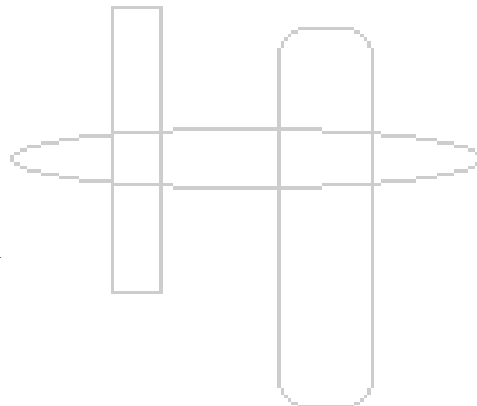
List of Practicals:

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.	
6.	Analyse a newspaper article	Use of Audio, video 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

Course Name: Environmental Science

Course Code: HS155AU   Course Type: AU

Credits: Audit   Teaching Scheme: Theory   : 02 Hours / Week

Unit 1 : Nature of environmental studies   (6 Hours)
Definition, scope, importance, multidisciplinary nature of environmental studies, need of public awareness, Role of an individual in conservation and equitable use of natural resources, sustainable lifestyles, Natural resources and associated problems : Forest, water, mineral, food, energy, land resources

Unit 2 : Ecosystems   (4 Hours)
Concept, Structure, function, characteristics of ecosystems, energy flow in ecosystem, producers, consumers, and decomposers, ecological succession

Unit 3 : Biodiversity and its conservation   (4 Hours)
Introduction, value, hot spots, of biodiversity, threats to biodiversity, conservation of biodiversity

Unit 4 : Environment pollution   (6 Hours)
Introduction, definition, types of pollution, cause and effect of pollution, solid waste management, role of an individual in prevention of pollution, disaster management

Unit 5 : Social issues and the environment   (4 Hours)
Unsustainable to sustainable development, urban problems related to energy, water conservation, environmental ethics, climate change, global warming, ozone layer depletion, wasteland reclaimation, consumerism and waste products

Unit 6 : Environmental protection   (6 Hours)
Environmental protection act, AIR (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife protection act, Forest conservation act, population growth and human health, human rights

Text Books:
1. *Erich Bharucha;Textbook of Environmental Studies for Undergraduate Courses,Second Edition,UGC Publications.*
2. *Mackenzie L. Davis and David A. Cornwell.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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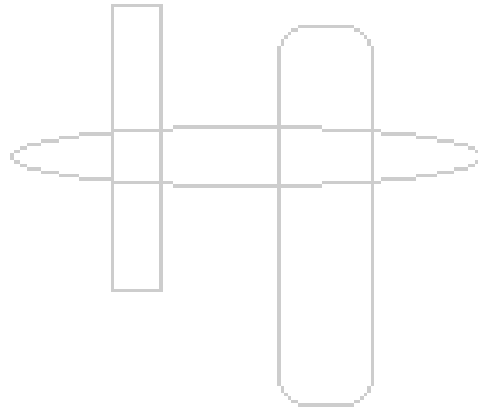
Course Name: Machining Workshop

Course Code: ME154L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: Fitting
Introduction, Use of marking tools such as vernier caliper, vernier height gauge, micrometer, center punch, try squares, steel rule, and hand tools such as files, hand saw, chisels, taps, bench vice, angle plate, surface plate etc. Safety Precautions, One job involving different operations such as sawing, tapping, filling and chiseling etc.

Unit 2: Turning
Introduction to Lathe machine, Main parts and their functions. Lathe operations such as turning, facing, chamfering, drilling etc. Measuring instruments like vernier caliper, micrometer etc. safety precautions, demonstration and one job on mild steel

Unit 3: Milling
Introduction of Milling machine, Main parts and their functions, safety precautions, demonstration of plain milling operation,

Unit 4: Sheet Metal and Press Work
Introduction, Use of marking and hand tools such as marker, scissors, measuring gauge, soldering iron etc. safety precautions, demonstration and hands on experience of few operations such as marking, cutting, bending etc. Introduction of fly press and cuttings dye punch along with its demonstration

Text Books:
1. *S. K. Harja Chudhary, Elements of Workshop Technology, Media Promoters and Publishers Pvt. Ltd.*
2. *K. T. Kulkarni Introduction to Industrial Safety,*

Reference Books:
1. *H. Geng, Manufacturing Engineering Hand Book, McGraw Hill Publishing Co.Ltd..*
2. *L. E. Doyle, Manufacturing Processes and Materials for Engineering, Prentice Hall Inc.,*

Course Outcome:
The student will be able to
1. Perform few fitting and turning operations
2. Follow safety practices.

Course Name: Aerobics

Course Code: GP101L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1 :   **(5 Hours)**
Introduction of blocks and beats

Unit 2 :   **(5 Hours)**
Revision of block and beats, introduction of floor exercises

Unit 3 :   **(5 Hours)**
a. Revision of block and beats, introduction of floor exercises
b. Introduction of steps

Unit 4 :   **(5 Hours)**
a. Revision of block, beats, floor exercises, steps
b. Introduction of choreography

Unit 5 :   **(5 Hours)**
a. Revision of block, beats, floor exercises, steps, choreography
b. Introduction of beat caching

Unit 6 :   **(5 Hours)**
Self Choreography

Course Outcomes:
The student will be able to –
1. Demonstrate blocks and beats
2. Demonstrate floor exercise
3. Make their own steps
4. Make their own choreography
5. Coordinate their own steps with songs
6. Self independent of aerobic workout

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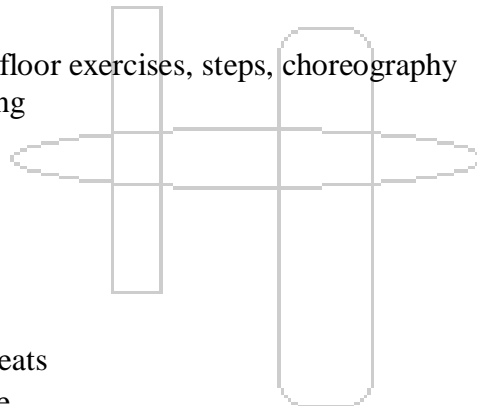
Course Name: Bharatnatyam

Course Code: GP102L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1 :   **(5 Hours)**
Basic groups of bharatnatyam ,knowledge about all classical dance style, learning first two groups in three speeds

Unit 2 :   **(5 Hours)**
Getting started with hand gestures or Mudras, demonstrations of use of 'Hasta Mudras', saying 'Taal' on your hand

Unit 3 :   **(2 Hours)**
Learning 3rd and 4th groups, introduction to 'Abhinaya' or 9 'emotions' in dance, demonstration of 'Abhinay'

Unit 4 :   **(5 Hours)**
Practical learning of 5th and 6th groups, next level 'Mudras' and uses, knowledge about 'Anarya Abhinaya'

Unit 5 :   **(5 Hours)**
Performing 3,4,5,6 in 3 speeds, demonstration of saying steps in different Taals, learning 5 'Gaatis'

Unit 6 :   **(5 Hours)**
Small dance drama based on 'Navaras' using all adavus learnt before and setting a dance , saying all steps in different 'Laya' and 'Taals'

Reference Books:
1. *"Natyashashtra" Bharat Mano*
2. *"Abhinaydarpana" A.C. Nandikeswara*

Course Outcomes:
The student will be able to –
1. Perform the basic steps of bharatnatyam
2. Demonstrate 'Mudras' and their uses in dance.
3. Perform the groups in different speeds.
4. Use the 9 Emotions in dance
5. Set up or choreograph a small dance piece on music
6. Set up a dance drama in groups set to music

FF No. : 654

Course Name: Chess

Course Code: GP103L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1:   **(5 Hours)**
Origin of the game, Setting up the board, How to move pieces, **Notation,** Basic Notation, Special Notation(castling, capturing of pieces), **Special Moves,** Castling, En-passant, How a game is won, How a game is drawn, Types of draw

Unit 2: Basic concepts   **(5 Hours)**
Attack, Support, Check, Check-Mate, Stale-Mate, Exchange of pieces, Revision + Remaining Portion, **Three stages-** Opening, Middle game, Endgame

Unit 3: Opening   **(5 Hours)**
Basic rules of development, Types of openings

Unit 4: Basic elementary mates   **(5 Hours)**
The Queen mate, The two rooks mate, The one rook mate, Challenging problems, The double bishops mate, The bishop & knight mate

Unit 5: Middle game   **(5 Hours)**
Themes - Pin, Fork, Double Attack, Back Rank, Discovered Attack, Discovered Check, Passed Pawn, under promotion, Smothered Mate, Destroying the defender.

Unit 6: Endgame   **(5 Hours)**
King Pawn ending, Rook pawn ending, Selected games of great players, Tournament (Playing Practise)

Course Outcomes:
The student will be able to –
1. Improve concentration, planning, calculations and management skills (management skills includes time management as well as resource management)
2. Calculate at least next 3 to 4 moves at the time of playing a game
3. Solve all types of checkmates (1 Queen, 2 Rooks, 1 Rook, and 2 Bishops)
4. know all types of themes that are used in chess.
5. Participate in the chess tournament and can score very well.

FF No. : 654

Course Name: Drawing and Painting

Course Code: GP104L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: Elements of Art   **(5 Hours)**
Introduction to art media and its applications- different art media- pencils, color pencil, crayons, poster, erasers, acrylic, rendering, and shedding skills

Unit 2: 2D and 3D design   **(5 Hours)**
Introduction to basic sketching techniques- drawing with different sketching techniques, freehand sketching of objects of day –to - day life

Unit 3: Color theory   **(5 Hours)**
Introduction to color painting and color theory- color schemes

Unit 4: Figure drawing   **(5 Hours)**
Figure drawing –Human proportion and figure construction, study of bone and muscle structure

Unit 5: Art History   **(5 Hours)**
Prehistoric to Renaissance, Renaissance to modern art

Unit 6: Graphics Design   **(5 Hours)**
Graphics Design process of visual communication and more of typography, photography and illustration

Text Books:
1. *"Contemporary Indian art other realities"Yashodhara Dalmia, Marg Publications.*
2. *"Contemporary art in India- A perspective" Pran Nathmago, National book trust India*
3. *"Contemporary art in Baroda" G. M. Shaikh, Tulika books Delhi*
4. *"Color Theory", J. J. Jagtap, Jagtap Publishing House Pune.*
5. *"Visual Art", J. J. Jagtap, Jagtap Publishing House Pune.*

Course Outcomes:
The student will be able to –
1. Understand fundamental of visual art, colour study, human proportion etc
2. Enable student to enhance their practical skills
3. Facilitate awareness of current trend and movement in the field of visual art
4. To cultivate good communication skills and appreciation of work.
5. Develop leadership competency qualities among follow binges.
6. Provide interdisciplinary approach in visual art.

FF No. : 654

Course Name: Flute

Course Code: GP105L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1 :   **(5 Hours)**
Introduction with Flute & Flute Parts, Basic Finger Movement Exercises

Unit 2 :   **(5 Hours)**
Theory of Swaras & Ragas and Basic Element of Music, Prepare Alankaras & Dhuns

Unit 3 :   **(5 Hours)**
Small lead tunes with finger exercises

Unit 4 :   **(5 Hours)**
Introduction of Saptak, Komal and Trivra Swaras

Unit 5 :   **(5 Hours)**
Full length lead Songs

Unit 6 :   **(5 Hours)**
Basic Dhun Patterns and few songs

Course outcome :
After successful completion of course Students will be able to:
1. Knowledge of basic Theory of Flute & Music and Best Finger movements on flute.
2. Knowledge of Swaras & Ragas and also know relationship between them. Able to play Sargams, Dhuns, and songs.
3. Play any lead song with the help of Notation.
4. Able to recognize the knowledge of swaras in every Saptak. (Shudha, Komal and Trivra Swaras)
5. Able to play full length lead Songs on flute
6. Able to accompaniment for any song with Different rhythm patterns.

Course Name: Guitar

Course Code: GP106L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1 :   **(4 Hours)**
Introduction of guitar and its parts, basic finger movement exercises

Unit 2 :   **(4 Hours)**
Advance figure movements exercises and small tunes

Unit 3 :   **(6 Hours)**
Introduction of scale and it's positions

Unit 4 :   **(6 Hours)**
Long length songs and introduction of chords

Unit 5 :   **(6 Hours)**
How to construct the chords form scale

Unit 6 :   **(5 Hours)**
Recognize the notes, chords of the song and play notes, chords of the songs by different strumming patterns

Course outcome :
After successful completion of course Students will be able to:
1. Identify different parts of guitar
2. Recognize different scale of music for guitar
3. Play the skills and identify notes and scales for song
4. Demonstrate the chords based on scales
5. Play chords and rhythm pattern on guitar
6. Accompany and play complete song on guitar by using chords and scales
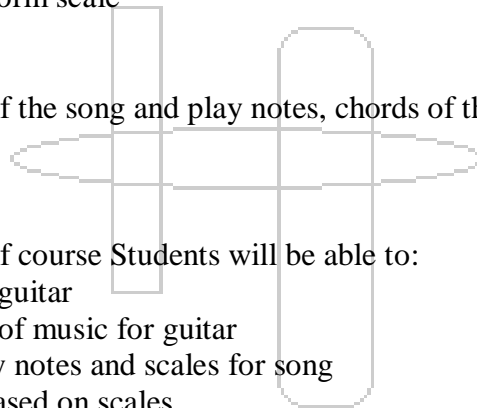
Course Name: Photography

Course Code: GP108L **Course Type: L**

Credits: 1 **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: Introduction and history of Photography **(4 Hours)**
Introduction: Course Syllabus discussion, Overall roadmap, grading criteria
History of Photography: Camera, Black and white film, Colored images, Milestones in photography

Unit 2: Creative Camera modes **(4 Hours)**
Exposure, Automatic Modes, Semi-Automatic Modes and Fully Manual Mode

Unit 3: Basic techniques and knowledge of Compositional aspects **(4 Hours)**
Composition elements, rules, dos and don'ts, Subject placement, Setting up the camera angle to create different meaning and tone of the photograph captured

Unit 4: Aesthetics **(6 Hours)**
Perspective creation and distortion, Theme based photography, Creating intentional blurred images

Unit 5: Digital Knowhow **(6 Hours)**
Introduction to Digital Sensor, Image Sharpness, Histogram, High Dynamic Range (HDR) imaging

Unit 6: Field Assignments **(6 Hours)**
Practicing various techniques to create good photographs based upon the covered tricks and techniques

Course Outcomes:
The student will be able to –
1. Handle digital camera confidently
2. Use different camera modes and also understand the difference between these modes
3. Capture photograph with different composition techniques
4. Put desired aesthetic sense and effects in the created photograph
5. Convey the story through photograph
6. Understand different types of digital cameras and basic digital sensor technology

Course Name: Tabla

Course Code: GP109L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1:   **(5 Hours)**
Tabla and Rhythm Introduction

Unit 2:   **(5 Hours)**
Playing basic tukda

Unit 3:   **(5 Hours)**
Padhant tukda

Unit 4:   **(5 Hours)**
Taal Introduction

Unit 5:   **(5 Hours)**
Padhan Teen Taal

Unit 6:   **(5 Hours)**
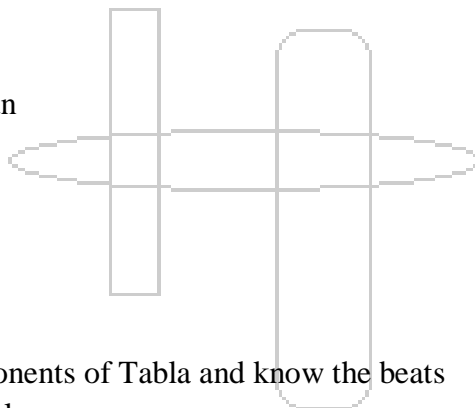Playing Teen Taal with Padhan

Text Books:
1. *Tabla Guide*

Course Outcomes:
The student will be able to –
1. Identify the various components of Tabla and know the beats
2. Know the language of Tabla
3. Understand how to utter the padhan
4. Know about the taal
5. Know about taal with padhan
6. Know about the basic performance about taal and tukada

Course Name: Taekwondo

Course Code: GP110L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: Basic Stance   **(5 Hours)**
Introduction of Stances, Type of stance, Use of Stance,etc.

Unit 2: Basic Blocks   **(5 Hours)**
Introduction of Blocks, Type of Blocks, Use of Blocks,etc.

Unit 3: Basic Kicks   **(5 hours)**
Introduction of Kicks, Type of Kicks, Use of Kicks,etc.

Unit 4: Combination of Blocks & Kicks   **(5 hours)**
Combination of various Blocks & Kicks together

Unit 5: Taekwondo Sparring   **(5 hours)**
Professional Taekwondo Fight

Unit 6: Self Defense Techniques   **(5 hours)**
Wrist Grab, Shirt Grab, Defense from Punch & Kick, Headlock, Bear Hug from Behind or Front, Two Attackers, etc.

Course Outcomes:
The student will be able to –
1. Demonstrate and identify different basic stances
2. Demonstrate and identify different blocks and to use them
3. Demonstrate and identify different kicks
4. Demonstrate Sparring Stance and variety of kicks and double or even triple kicks can be performed in quick succession.
5. Engage and attempt to best each other in a controlled form of mock combat or fight.
6. Demonstrate certain self defence techniques like wrist grab, headlock etc.

Course Name: Vocal

Course Code: GP111L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1:   **(5 Hours)**
 Introduction of basic vocal music

Unit 2:   **(5 Hours)**
Basic knowledge of Swaras

Unit 3:   **(5 Hours)**
Basic swara Alankar or Sargam. One song

Unit 4:   **(5 Hours)**
 raag yaman and one song based on it

Unit 5:   **(5 Hours)**
Raag sarang and bhimplas and one song based on them

Unit 6:   **(5 Hours)**
Different types of music, difference between classical and light music, bhajan, gazhal, duet song,etc.

Course Outcomes:
The student will be able to
1. To know what is vocal music
2. Sing basic swaras
3. Sing & knowledge of swaralankar
4. knowledge of Raag Yaman
5. knowledge of Raag Sarang & Bhimpalas
6. knowledge & sing different music such as Bhajan,Gazal,Duet song etc.

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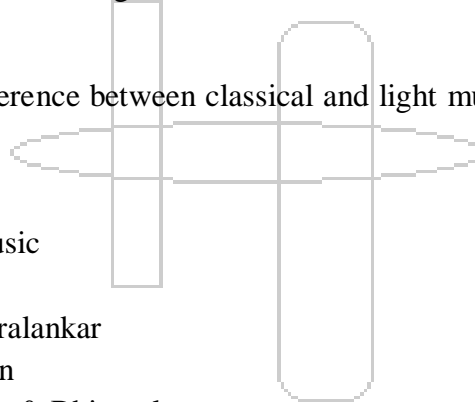
Course Name: Yoga and Pranayam

Course Code: GP112L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: Breathing exercises   **(5 Hours)**
Various types of "Pranayam" like Bhasrika, Anulom-Vilom, Sooryabhyas, Chandrabhyas, Kapalbhati, Shwasawarodh, Bhramari

Unit 2: Omkar Sadhana   **(5 Hours)**
Breaking down of Omkar into Akar, Ukar and Makar. Chanting of all these. Chanting of the whole Omkar. Mudra Pranayam (6 types), Group Omkar.

Unit 3: Yogasan   **(5 Hours)**
Yogasanas in different postures- while lying down on back, while lying down on stomach, while standing up, while sitting down. Correct postures of all Yogasanas and thoir benefits.

Unit 4: Sooryanamaskar   **(5 Hours)**
Correct method of performing the sun salutations and their benefits.

Unit 5: Sooryanamaskar with Pranayam   **(5 Hours)**
Correct method of performing the sun salutations coupled with Pranayam and their benefits.

Unit 6: Guided Meditation and Yoganidra   **(5 Hours)**
Guided Meditation for positive thinking and Yoganidra for a relaxed body and mind.

Course Outcomes:
The student will be able to –
1. Perform various types of Pranayam like Nadishodhan, Sooryabhyas, Chandrabhyas, Bhasrika, Rapid inhalation and exhalation and various types of Mudra Pranayam.
2. Chant "Omkar" in its root form as well as modified form. Students shall be able to feel the positive vibrations created by correct chanting of "Omkar".
3. Perform various yogasans in their correct posture form and experience their benefits towards health, body posture and flexibility.
4. Demonstrate scientifically correct Sun Salutions i.e Sooryanamaskars and reap its benefits.
5. Harmonise Sooryanamaskars alongwith Pranayam and energies themselves.
6. Relax their body and mind through guided Meditation and Yoganidra helping thereby to calm down, channelize their energy in the right manner and concentrate better.

Course Name: Film Appreciation

Course Code: GP115L   **Course Type: L**
Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1: The Purposes & Development of Art   **(5 Hours)**
What is it? Why we create? Prehistoric – Paleolithic art forms, Art in daily lives – Designs for better livelihood, Birth of architecture and sculpture, Rules of Aesthetics in Painting, Architecture and Photography, Basic elements of Art; Colour wheel; Colour Theory; Colour schemes

Unit 2: Precursors, Birth, and Development of Cinema   **(5 Hours)**
Story telling through pictures, Magic lantern, Shadow puppets, Birth of Photography, first motion photography and first attempt to film, Narrative based films, Early special effects, Animation and early documentaries, Cinema in twenties and thirties

Unit 3: Technological developments, World Wars, & Modern Cinema   **(5 Hours)**
Sound in cinema, Emerging Studio systems around the world and its reparations over cinema, Cinema as political critique of war, Italian Neorealism; depicting Socio-Political-Economical-Cultural situation in Europe, Non-conventional style of Filmmaking, European Art Cinema, French new wave, Cinema around the world

Unit 4: Cinema of India & Genres in Cinema, in Sixties and Seventies **(5 Hours)**
Parallel Cinema movement in India, Genres: Noir, Western, Comedy, Drama, Sci-Fi and Musical**,** Cinema representing Changing Political Ideologies**,** Experimentation through Documentaries and non-fiction

Unit 5: Influences & Contemporary Practices   **(5 Hours)**
Experimentation in world cinema using other art forms, Non-traditional use of technological and Narrative mediums, Experimentation in Fiction, non-fiction films, Independent cinema; Socio-political and cultural representation through cinema, Influence of Cinema over other audio-visual art forms, Theatre and literature

Unit 6: Changing media   **(5 Hours)**
Cinema in 21st century, Changing cinema in digital age; new avenues

Reference Books:
1. James Monaco,*'How to Read a Film: Movies, Media, and Beyond*' (Fourth Edition), Oxford University Press, 2009
2. Robert Sklar, '*An International History of the Medium'* (Second edition), Pearson, 2001
3. Satyajit Ray, *'Our Films Their Films'* Orient Blackswan Private Limited, 2012

Course Outcomes:
The student will be able to –
1. Understand the purpose and development of art in its historical context
2. Understand the development of cinema in its historical context
3. Analyze and interpret framework of cinema
4. Understand the development of language of cinema
5. Have information about the history of cinema

6. Know the experimentation in world cinema and influence of cinema over other art forms

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Course Name: Violin

Course Code: GP122L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1:   **(4 Hours)**
Introduction of violin, its parts, basic finger movements.

Unit 2:   **(4 Hours)**
Introduction of 4 strings. Introduction of scale and different positions.

Unit 3:   **(4 Hours)**
Introduction of basic sargam on all strings.

Unit 4:   **(6 Hours)**
Advance finger movemement

Unit 5:   **(6 Hours)**
Sargam with Tabla.

Unit 6:   **(6 Hours)**
 Introduction of raag Bhoop.

Course Outcomes:
The student will be able to –
1. Identify different parts of violin.
2. Identify different scales.
3. Play the sargam.
4. Skillfully manage the bow and fingers simultaneously.
5. Play along with tabla.
6. Perform raag Bhoop with alaap
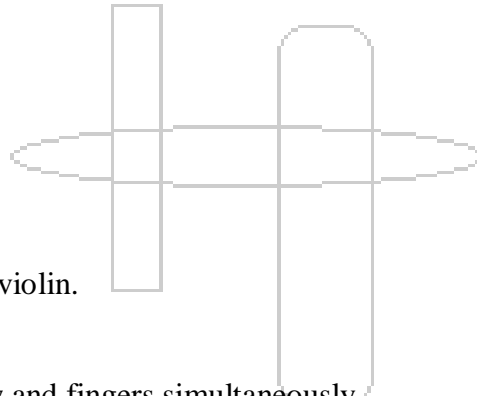
Course Name: Health Awareness and Monitoring

Course Code: GP123L   **Course Type: L**

Credits: 1   **Teaching Scheme: Lab: 02 Hours / Week**

Unit 1:   **(4 Hours)**
Introduction of Health & Need of Global awareness.

Unit 2:   **(6 Hours)**
Basics of Human Anatomy & Physiology

Unit 3:   **(4 Hours)**
Preventive & Social Medicines

Unit 4:   **(6 Hours)**
Basics of Diseases, Medicines

Unit 5:   **(4 Hours)**
GMP & Manufacturing of Medicines.

Unit 6:   **(4 Hours)**
Lifestyle Disorders, Alternative Medicines & Yoga

Course Outcomes:
The student will be able to –
1. Know basic of health, current scenario and need
2. Know about human body mechanism
3. Understand basics of social health
4. Vital signs, Parameters, Measuring Aids & Instruments, First aid and basic emergency management.
5. Manufacturing processes,
6. Know strength of indigenous systems to prevent diseases, students can research and find mechanical solutions & instrumentization for these branches.