Course Title	TRANSFORMS AND STATISTICAL METHODS	Semester	III
Course Code	MVJ20MAE31 /MAS31/MME31	CIE	50
Total No. of Contact Hours	40 L:T : P :: 3: 1 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3hrs

Course objective is to:		
This course will enable students to		
• Comprehend and use of analytical and numerical methods in different engineering fields.		
• Apprehend and apply Fourier Series.		
• Realize and use of Fourier transforms.		
• Realize and use of Z-Transforms.		
• Use of statistical methods in curve fitting applications.		
Module-1	L1,L2 & L3	8 Hours
Laplace Transform: Definition and Laplace transforms of elementary functions. Laplace transforms of Periodic functions and unit-step function and problems. **Inverse Laplace Transform:** Definition and problems, Convolution theorem to find the inverse Laplace transforms and problems. **Applications**: Solution of linear differential equations using Laplace transforms. **Web Link and Video Lectures:** https://www.youtube.com/watch?v=8oE1shAX96U https://www.intmath.com/laplace-transformation/7-inverse-laplace-transform.php		
Module-2	L1,L2 & L3	8 Hours
Fourier series: Recapitulation of Series, Continuous and Discontinuous functions, Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period $2l$, Half-range Fourier sine and cosine series, Practical Harmonic Analysis and Problems. **Web Link and Video Lectures:** https://www.youtube.com/watch?v=Sq2FhCxcyI8 https://www.youtube.com/watch?v=4N-IwHUCFa0		
Module-3	L1,L2 & L3	8 Hours
Fourier transforms: Infinite Fourier transform, Infinite Fourier sine and cosine transforms, Inverse Fourier transforms, Inverse Fourier sine and cosine transforms, Convolution theorem. **Web Link and Video Lectures:** https://www.youtube.com/watch?v=spUNpyF58BY		

Module-4	L1,L2 & L3	8 Hours

Z-Transforms:

Z-transform: Difference equations, basic definition, z-transform –definition, Standard z-transforms, Damping rule, Shifting rule, Initial value and final value theorems (without proof) and problems, Inverse Z-transform.

Applications: Application of Z- transforms to solve difference equations.

Web Link and Video Lectures:

http://www.eas.uccs.edu/~mwickert/ece2610/lecture_notes/ece2610_chap7.pdf

https://electricalbaba.com/final-value-theorem-and-its-application/

Module-5	L1,L2& L3	8 Hours

Curve Fitting:

Curve fitting by the method of least squares. Fitting of the curves of the form $y = ax + b$, $y = ax^2 + bx + c$, $y = ae^{bx}$.

Statistical Methods:

Introduction, Correlation and coefficient of correlation, Regression, lines of regression and problems.

Web Link and Video Lectures:

https://mathbits.com/MathBits/TISection/Statistics2/correlation.htm

https://www.youtube.com/watch?v=xTpHD5WLuoA

Course outcomes:	
CO1	Use Laplace transform and inverse transforms techniques in solving differential equations.
CO2	Demonstrate Fourier Transform as a tool for solving Integral equations.
CO3	Demonstrate Fourier Transform as a tool for solving Integral equations.
CO4	Apply Z Transform to solve Difference Equation.Use Method of Least Square for appropriate Curves.
CO5	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.

Text Books:	
1	Prof G.B.Gururajachar "Engineering Mathematics-III , Academic Excellent series Publications, 2016-17
2	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013
Reference Books:	
1	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10thedition,2014.
2	Ramana B. V., "Higher Engineering Mathematics", Tata McGraw-Hill, 2006.
3	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition.

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (10 marks)
- Assignment (10 marks)

SEE Assessment:

i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

iii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	3	0	0	0	0	0	0	1	0
CO2	3	3	0	3	0	0	0	0	0	0	0	1
CO3	2	3	0	3	0	0	0	0	0	0	1	0
CO4	3	3	0	3	0	0	0	0	0	0	0	0
CO5	3	3	0	2	0	0	0	0	0	0	0	1

High-3, Medium-2, Low-1

Course Title	AEROTHERMODYNAMICS	Semester	III
Course Code	MVJ20AE32/AS32	CIE	50
Total No. of Contact Hours	50 L: T : P :: 4: 1 : 0	SEE	50
No. of Contact Hours/week	5	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to: This course will enable students to

- Understand various concepts and definitions of thermodynamics.
- Comprehend the I-law of thermodynamics.
- Comprehend the II-law of thermodynamics
- Acquire the knowledge of Pure Substances & Ideal Gases
- Acquire the knowledge of various types of gas cycles.

Module-1	L1, L2, L3	10 Hours

Fundamental Concepts & Definitions:

Thermodynamics definition and scope, Microscopic and Macroscopic approaches. Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and control surface, examples. Thermodynamic properties; definition and Modules, intensive and extensive properties. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic; processes; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics, Temperature; concepts, scales, fixed points and measurements.

Work and Heat:

Mechanics-definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions for displacement work in various processes through p-v diagrams. Shaft work; Electrical work. Other types of work

Laboratory Sessions / Experimental learning:

To determine the unknown area of a given drawing using planimeter

Applications:

1.For temperature measurements

2.To obtain displacement work

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/104/101104067/		
Module-2	L1, L2, L3	10Hours

First Law of Thermodynamics:

Joules experiments, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy, pure substance; definition, two-property rule, Specific heat at constant volume, enthalpy, specific heat at constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications, analysis of unsteady processes such as film and evacuation of vessels with and without heat transfer

Laboratory Sessions/ Experimental learning:

https://www.youtube.com/watch?v=suuTC9uGLrIhttps://www.youtube.com/watch?v=7bJywbP7ZIU

Applications:

     1.Conservation of energy principle to Heat and Thermodynamic processes

     2.Compressors, Blowers, Steam or Gas Turbines, IC engines Video link / Additional

online information (related to module if any):

https://nptel.ac.in/courses/101/104/101104067/

Module-3	L1, L2, L3	10Hours

Second Law of Thermodynamics:

Devices converting heat to work; (a) in a thermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir. Direct heat engine; schematic representation and efficiency. Devices converting work to heat in a thermodynamic cycle; reversed heat engine, schematic representation, coefficients of performance. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II, Clausius statement of Second law of Thermodynamics, Equivalence of the two statements; Reversible and Irreversible processes; factors that make a process irreversible, reversible heat engines, Carnot cycle, Carnot principles.

Entropy:

Clasius inequality; Statement, proof, application to a reversible cycle. Entropy; definition, a property, change of entropy, principle of increase in entropy, entropy as a quantitative test for irreversibility, calculation of entropy using Tds relations, entropy as a coordinate. Available and unavailable energy.

 Laboratory Sessions/ Experimental learning:

https://www.youtube.com/watch?v=7OJG-ZHrbD8https://www.youtube.com/watch?v=7bJywbP7ZIUhttps://www.youtube.com/watch?v=2vHLJjlinjw

Applications:

    1.   All types of heat engine cycles including Otto, Diesel, etc

2. Refrigerators and heat pumps based on the Reversed Carnot Cycle

3. Mixing of two fluids, heat transfer through a finite temperature difference

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/104/101104067/

Module-4	L1, L2, L3	10Hours

Pure Substances & Ideal Gases:

Mixture of ideal gases and real gases, ideal gas equation, compressibility factor use of charts. P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, Saturated liquid, mixture of saturated liquid and vapour, saturated vapour and superheated vapour states of pure substance with water as example. Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and HS diagrams, representation of various processes on these diagrams.

Thermodynamic relations:

Maxwell`s equations, Tds relations, ratio of heat capacities, evaluation of thermodynamic properties from an equation of state

Laboratory Sessions/ Experimental learning:

https://www.youtube.com/watch?v=Juz9pVVsmQQhttps://www.youtube.com/watch?v=L1AHGHRvv9s

Applications: Working fluids and its properties, in power plants for power generations.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/104/101104067/

Module-5	L1, L2, L3	10Hours

Gas Cycles:

Efficiency of air standard cycles, Carnot, Otto, Diesel cycles, P-V & T-S diagram, calculation of efficiency, Numerical

vapour power cycle:

Carnot vapour power cycle, simple Rankine cycle, Analysis and performance of Rankine Cycle, Ideal and practical regenerative Rankine cycles – Reheat and Regenerative Cycles, Binary vapour cycle.

Laboratory Sessions/ Experimental learning:

To determine the unknown area of a given drawing using planimeterTo calculate the thermal efficiency of Petrol cycle. To calculate the thermal efficiency of Diesel cycle.

Applications:

IC engines, Gas turbine engines etc..

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/104/101104067/

Course outcomes:	
CO202.1	Apply the concepts of thermodynamics in various engineering problems.

CO202.2	Differentiate thermodynamic work and heat and apply I law of thermodynamics to different process
CO202.3	Differentiate thermodynamic work and heat and apply II law of thermodynamics to different process
CO202.4	Apply the concepts of Pure Substances & Ideal Gases
CO202.5	Apply the principles of various gas cycles

Reference Books:	
1	A Venkatesh, Basic Engineering Thermodynamics, Universities Press, India, 2007, ISBN 13: 9788173715877
2	P K Nag, Basic and Applied Thermodynamics, 2nd Ed., Tata McGraw Hill Pub. 2002, ISBN 13: 9780070151314
3	YunusA.Cenegal and Michael A.Boles, Thermodynamics: An Engineering Approach, TataMcGraw Hill publications, 2002, ISBN 13: 9780071072540
4	J.B.Jones and G.A.Hawkins, Engineering Thermodynamics, Wiley 1986, ISBN 13: 9780471812029

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
iv. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. v. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. vi. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1		1
CO2	3	3	2	2	1	1	1	1	1	1		1

CO3	3	3	2	2	1	1	1	1	1	1		1
CO4	3	3	2	2	1	1	1	1	1	1		1
CO5	3	3	2	2	1	1	1	1	1	1		1

High-3, Medium-2, Low-1

Course Title	ELEMENTS OF AEROSPACE TECHNOLOGY	Semester	III
Course Code	MVJ20AS33	CIE	50
Total No. of Contact Hours	40 L: T : P :: 3: 1 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:		
1.Understand basic principles of Aircraft and the history of space vehicles. 2.Acquire the basic principles of flight. 3.Learn the basic principle of Aircraft & Rocket propulsion. 4.Understand the Aircraft Structures and Materials. 5.Acquire the basics of Aircraft Instruments & systems.		
Module-1	RBT Level	Hours
Introduction to Aircrafts: History of aviation, International Standard atmosphere, Atmosphere and its properties, Temperature, pressure and altitude relationships, Classification of aircrafts, V/STOL machines. Introduction to Space Flight: History of Space Flight & spacecraft technologies Difference between space and atmosphere, upper atmosphere, Introduction to basic orbital mechanics, types of Orbits (LEO, MEO, Geosynchronous and Geostationary, Polar orbits), Kepler's Laws of planetary motion. Laboratory Sessions/ Experimental learning: Ornithopter modelling, Paper plane. Applications: Environmental conditions Video link / Additional online information (related to module if any): https://nptel.ac.in/courses/101101079/		
Module-2	RBT Level	Hours
Basic principles of flight: Significance of speed of sound, Propagation of sound, Mach number, subsonic, transonic, supersonic, hypersonic flows, Bernoulli's theorem, Aerodynamic forces and moments on an Airfoil, Lift and drag components, lift curve, drag curve, types of drag, factors affecting lift and drag; Centre of pressure and its significance, Aerodynamic centre, Aspect ratio, Airfoil nomenclature, Basic characteristics of airfoils, NACA nomenclature, Simple problems on lift and drag. Laboratory Sessions/ Experimental learning: Aerodynamics lab Applications: Aircraft Flow		

dynamics

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101104061/https://nptel.ac.in/courses/101101079/

Module-3	RBT Level	Hours

Aircraft Propulsion: Introduction, Classification, Piston Engine & its application, Brayton cycle, Principle of operation of Turboprop, turbojet and turbofan engines, Introduction to ramjets and scramjets; performance characteristics.

Rocket Propulsion: Principles of operation of rocket, Classification of Rockets, Types of rockets and typical applications, Introduction to Space Exploration.

Laboratory Sessions/ Experimental learning: Propulsion lab

Applications: Aircraft engines

Video link / Additional online information (related to module if any): https://nptel.ac.in/courses/101101079/

Module-4	RBT Level	Hours

Aircraft and Spacecraft – Structures and Materials:

Introduction- General types of construction, Monocoque, Semi-Monocoque and Geodesic structures. Typical wing and fuselage structure; Metallic and non-metallic materials for aircraft application. Use of aluminum alloy, titanium, stainless steel and composite materials. Materials selection for spacecraft application.

Laboratory Sessions/ Experimental learning: Structures lab

Applications: Material & Structural Dynamics of Aircraft

Video link / Additional online information (related to module if any): https://nptel.ac.in/courses/101101079/

Module-5	RBT Level	Hours

Instrument:

Instrument Displays, Introduction to Navigation Instruments, Basic Air data systems & Probes, Mach meter, Air speed indicator, Vertical speed indicator, Altimeter, Gyro based instruments, Introduction to spacecraft instruments. Inertial & GPS based sensors.

Systems: Introduction to Hydraulic and pneumatic systems, Air Conditioning and Cockpit pressurization system, Generation and distribution of Electricity on board the airplane, Aircraft Fuel System, Fire Protection, Ice and Rain Protection System

Laboratory Sessions/ Experimental learning: Instrumentation lab.

Applications: Aircraft Instruments.

Video link / Additional online information (related to module if any): https://nptel.ac.in/courses/101101079/

Course outcomes:	
CO203.1	Differentiate the different concepts of aircrafts and spacecraft's in flight.
CO203.2	Describe the Principle of aviation and space flight.
CO203.3	Explain the Fundamentals of Rocket Propulsion and Aircraft Propulsion.
CO203.4	Apply the concepts of aircraft materials and structures.
CO203.5	Appreciate the complexities involved during development of flight vehicles systems.

Reference Books:	
1	John D. Anderson, "Introduction to Flight", McGraw-Hill Education, 8th edition, 2015, ISBN: 978-0078027673.
2	Lalit Gupta and O P Sharma, Fundamentals of Flight Vol-I to Vol-IV, Himalayan Books. 2006, ISBN: 9788170020752
3	Ian Moir, Allan Seabridge, "Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration", John Wiley & Sons, 3rd edition, 2011, ISBN: 9781119965206
4	Sutton G.P., "Rocket Propulsion Elements", John Wiley, New York, 9th edition,2016,ISBN: 9781118753910

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests   - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks)

SEE Assessment:
vii.   Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. viii.Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. ix.   One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	1	0	0	0	1	3	0	0	0	0	3
CO2	3	3	2	0	0	1	3	0	0	0	0	3
CO3	3	3	2	0	0	1	3	0	0	0	0	3
CO4	3	3	2	0	0	1	3	0	0	0	0	3
CO5	3	0	2	0	0	1	3	0	0	0	0	3

High-3, Medium-2, Low-1

Course Title	MECHANICS OF MATERIALS	Semester	III
Course Code	MVJ20AS34/AE34	CIE	50
Total No. of Contact Hours	40 L: T : P :: 3: 1 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:
• Comprehend the basic concepts of strength of materials.
• Acquire the knowledge of stresses due to bending
• Understand the different failure in materials

Module-1	L1, L2, L3	8Hours
Basics of linear elasticity: The concept of stress& strain, state of stress & Strain at a point, Equilibrium equations, The state of plane stress and plane strain. Compatibility equations, Constitutive Laws (Hooke's Law), Stressstrain curves for brittle and ductile materials, Allowable stress, Material selection for structural performance. **Simple & Compound Stresses**: Extension / Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections. Elongation due to self-weight. Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses, Introduction to Plane stress, stresses on inclined sections, principal stresses & strains, Analytical & graphical method (Mohr's Circle) to find principal stresses & strains. Laboratory Sessions/ Experimental learning: UTM in Material Testing Lab Applications: Testing of Mild steel components, Bricks Video link / Additional online information (related to module if any): Prof.Dr.Suraj Prakash Harsha,Indian Institute of Technology, Roorkee. Lecture – 12 for Ductile and Brittle Materials		

Module-2	L1, L2, L3	8Hours
Bending Moment and Shear Force in Beams: Introduction, Types of beams, loads and reactions, shear forces and bending moments, rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.		

Euler-Bernoulli beam theory: The Euler-Bernoulli assumptions, Implications of the Euler-Bernoulli assumptions, the Euler-Bernoulli Beam theory derivation, Bending stress equation, Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections (Only Numerical).

Laboratory Sessions/ Experimental learning: Different load conditions can be practiced in Structures Lab

Applications: Civil Construction with Symmetrical I & T sections

Video link / Additional online information (related to module if any): Prof: S .K.Bhattacharya, IIT, Kharagpur, Lecture no 24. Bending of Beams- III

Module-3	L1, L2, L3	8Hours

Deflection of Beams: Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple. Macaulay's method.

Torsion of Circular Shafts and Elastic Stability of Columns: Introduction. Pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts. Power transmitted by solid and hollow circular shafts.

Laboratory Sessions/ Experimental learning: Beam Expt in Structures lab and Torsion Test apparatus available in MT Lab.

Applications: Civil Construction and Automobile Transmission.

Video link / Additional online information (related to module if any):

Prof. S. K. Bhattacharyya Indian Institute of Technology, Kharagpur Lecture - 33 Deflection of Beams – IV

Prof. S. K. Bhattacharya Dept. of Civil Engineering I.I.T Kharagpur Lecturer#20 Torsion-III

Module-4	L1, L2, L3	8Hours

Virtual work principles: Introduction, Equilibrium and work fundamentals, Principle of virtual work, Principle of virtual work applied to mechanical systems, Principle of virtual work applied to truss structures, Principle of virtual work applied to beams. Principle of complementary virtual work, internal virtual work in beams and solids.

Energy methods: Conservative forces, Principle of minimum total potential energy, Strain energy

in springs, Strain energy in beams, Strain energy in solids, Applications to trusses, Development of a finite element formulation for trusses, Principle of minimum complementary, Energy theorems, Reciprocity theorems, Saint-Venant's principle

Laboratory Sessions/ Experimental learning: Few of the Energy Method Theorems can be explained from Structures Lab.

Applications: **Virtual work** arises in the **application** of the **principle** of least action to the study of forces and movement of a mechanical system.

Video link / Additional online information (related to module if any): Energy Methods in Structural Analysis Version 2 CE IIT, Kharagpur

Module-5	L1, L2, L3	8Hours

Mechanical Properties of materials:

Fracture: Type I, Type II and Type III.

Creep: Description of the phenomenon with examples. Three stages of creep, creep properties, stress relaxation.

Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

Laboratory Sessions/ Experimental learning: Impact Tests in MT lab for Fracture.

Applications: Boilers, Rotating Machine Elements

Video link / Additional online information (related to module if any):

Creep Deformation of Materials Dr.SrikantGollapudi Indian Institute of Technology, Bhubaneswar

Prof.K.Gopinath&Prof.M.M.Mayuram, Machine Design II, Indian Institute of Technology Madras

Course outcomes:	
CO304.1	Apply the basic concepts of strength of materials.
CO304.2	Compute stress, strain under different loadings.
CO304.3	Acquire the knowledge of deflection of beams
CO304.4	Acquire the knowledge of virtual work principle and energy methods
CO304.5	Identify different failures

Reference Books:	
1	T.H.G Megson "Introduction to Aircraft Structural Analysis", Butterworth-Heinemann Publications, 2007, ISBN 13: 9781856179324

| 2 | Beer F.P. and Johnston.R, Mechanics of Materials, McGraw Hill Publishers, 2006, ISBN13:978-0073380285. |
| 3 | Timoshenko and Young, Elements of Strength of Materials, East-West Press, 1976, ISBN 10: 8176710199 |

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
x. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. xi. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. xii. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1		1
CO2	3	3	2	2	1	1	1	1	1	1		1
CO3	3	3	2	2	1	1	1	1	1	1		1
CO4	3	3	2	2	1	1	1	1	1	1		1
CO5	3	3	2	2	1	1	1	1	1	1		1

High-3, Medium-2, Low-1

Course Title	MECHANICS OF FLUIDS	Semester	III
Course Code	MVJ20AE35/AS35	CIE	50
Total No. of Contact Hours	40 L: T : P :: 3: 1 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Understand the basic fluid properties.
- To estimate velocity, acceleration and stream function for an incompressible and inviscid flow along with governing equations of fluid flow.
- Understand the dimensional analysis and apply Bernoulli's and Euler's equation for flow measuring devices
- To calculate boundary layer thickness and drag co-efficient for laminar and turbulent flows
- Acquire the knowledge of compressible flows and boundary Layers

Module-1	L1,L2,L3	8Hours

Basic Considerations:

Introduction, Dimensions- Modules and physical quantities, Continuum view of gases and liquids, Pressure and Temperature scales, Physical properties of fluids.

Fluid Statics:

Pressure distribution in a static fluid, Pressure and its measurement, hydrostatic forces on plane and curved surfaces, buoyancy, illustration by examples.

Laboratory Sessions/ Experimental learning: Use of piezometer and manometers Applications: For pressure measurements by using different types of manometers.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/103/101103004/

Module-2	L1,L2,L3	8Hours

Fluids in motion:

Methods of describing fluid motion, types of fluid flow, continuity equation in 3 dimensions, velocity potential function and stream function. Types of motion, Source   sink, doublet, plotting of stream lines and potential lines Numerical problems.

Fluid Kinematics:

Kinematics of fluid motion and the constitutive equations, Integral (global) form of conservation

equations (mass, momentum, energy) and applications, Differential form of conservation equations (continuity, Navier-Stokes equations, energy equation).

Laboratory Sessions/ Experimental learning: An experimental study of the continuity equation and Bernoulli's equation by using Venturimeter, Orificemeter and pitot tube.

Applications: For rotational and irrotational fluid flows, laminar and turbulent fluid flows.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/103/101103004/

Module-3	L1,L2,L3	8Hours

Fluid Dynamics:

Equations of motion: Euler's and Bernoulli's equation of motion for ideal and real fluids. Momentum equation, Fluid flow measurements. Numerical problems.

Dimensional analysis and similarity:

Dimensional homogeneity, methods of dimensional analysis, model analysis, types of similarity and similitude. Dimensionless numbers. Model laws. Numerical problems

Laboratory Sessions/ Experimental learning: An experimental study of the continuity equation and Bernoulli's equation by using Venturimeter, Orificemeter and pitot tube.

Applications: flow measuring devices and model studies.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/103/101103004/

Module-4	L1,L2,L3	8Hours

Flow past Immersed bodies:

Introduction to boundary layer, boundary layer thickness, karman's integral momentum theory, drag on a flat plate for laminar and turbulent flow, Drag on immersed bodies. Expression for drag and lift. Kutta –joukowsky theorem; Fundamentals of airfoil theory Numerical problems.

 Laboratory Sessions/ Experimental learning: Determination of boundary layer thickness.

Applications: Flow over a sloid body, separation point and Understanding of lift and drag. Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/103/101103004/

Module-5	L1,L2,L3	8Hours

Compressible flow and Boundary Layers theory:

Steady, one-dimensional gas dynamics, Propagation of pressure waves in a compressible medium, velocity of sound , Mach number, Mach cone, Stagnation properties , Bernoulli's eqn for isentropicflow, normal shock waves . Numerical Problem; Laminar and turbulent boundary layers.

Laboratory Sessions/ Experimental learning: Propagation of disturbance for different Mach number

Applications: Compressible flows through nozzles, diffusers, turbines etc… Video link / Additional online information (related to module if any): https://nptel.ac.in/courses/101/103/101103004/

Course outcomes:

CO205.1	Evaluate the effects of fluid properties
CO205.2	Estimate velocity, acceleration and stream function for an incompressible and invisid flow along with governing equations of fluid flow.
CO205.3	Perform dimensional analysis and apply Bernoulli's and Eulers equation for various flow situations involving venturimeter, orificemeterand pitot-tube
CO205.4	Calculate boundary layer thickness and drag co-efficient for laminar and turbulent flows.
CO205.5	Illustrate the basic concepts of compressible flows.

Reference Books:

1	Bansal, R.K, Fluid Mechanics and Hydraulics Machines, Laxmi Publications (P) Ltd., New Delhi 2015,ISBN-13: 978-8131808153
2	Yunus A. Cengel& John M Cimbala, Fluid Mechanics and Applications, McGraw Hill Education; 3rd edition, 2013, ISBN-13: 978-0073380322.
3	Rathakrishnan. E, Fluid Mechanics, Prentice-Hall of India Pvt.Ltd, 2010, ISBN 13: 9788120331839.
4	Ramamritham. S, Hydraulic Fluid Mechanics and Fluid Machines, Dhanpat Rai&Sons, Delhi, 1988, ISBN 13: 9788187433804

CIE Assessment:

CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests

- Quizzes/mini tests (4 marks)
- Mini Project / Case Studies (8 Marks)
- Activities/Experimentations related to courses (8 Marks)

SEE Assessment:

xiii. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.

xiv. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.

xv. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1		1
CO2	3	3	2	2	1	1	1	1	1	1		1
CO3	3	3	2	2	1	1	1	1	1	1		1
CO4	3	3	2	2	1	1	1	1	1	1		1
CO5	3	3	2	2	1	1	1	1	1	1		1

High-3, Medium-2, Low-1

Course Title	AEROSPCE MATERIALS	Semester	III
Course Code	MVJ20AE36/AS36	CIE	50
Total No. of Contact Hours	40 L: T : P :: 3: 1 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- To impart knowledge on the basics of phase diagrams and their applications.
- To make the students to understand the use of non-ferrous materials in aircraft construction:
- To introduce various ferrous materials for aircraft construction
- To learn about the various applications of Composite materials in an aircraft
- To impart knowledge about Wood, fabric and other non- metals in Aircraft construction.

Module-1		L1,L2	8Hours

Phase diagrams and Microstructures:

Basic concepts - Gibbs phase rule – Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni).

The Fe-Fe3C phase diagram: phases, invariant reactions, development of microstructure in eutectoid, hypoeutectoid and hypereutectoid alloys – influence of other alloying elements in the Fe-C system. Microstructures: pearlite, bainite, spheroidite and martensite.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/103/101103004/https://www.youtube.com/watch?v=woNUlqu8ReE

https://www.youtube.com/watch?v=S7GH0FH0wtI

Module-2		L1,L2	8Hours

Non-ferrous materials in aircraft construction:

Aluminium and its alloys: Types   and identification. Properties - Castings - Heat treatment processes - Surface treatments.

Magnesium and its alloys: Cast and Wrought alloys - Aircraft application, features specification, fabrication problems, Special treatments.

Titanium and its alloys: Applications, machining, forming, welding and heat treatment.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/113/105/113105021/

https://www.intechopen.com/books/aluminium-alloys-recent-trends-in-processing-characterization-mechanical-behavior-and-applications

https://www.intechopen.com/books/titanium-alloys-novel-aspects-of-their-manufacturing-and-processing

Module-3	L1,L2	8Hours

Ferrous materials in aircraft construction:

Steels : low, medium and high carbon steels , alloy steels, corrosion resistant steels, structural applications.

Maraging Steels: Properties and Applications.

Super Alloys: Use - Nickel base - Cobalt base - Iron base - Forging and Casting of Super alloys - Welding, Heat treatment.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/113/105/113105057/

https://nptel.ac.in/courses/113/104/113104059/

https://www.coursera.org/lecture/ferrous-technology-2/introduction-and-classification-mknez

Module-4	L1,L2	8Hours

Composites:

Definition and comparison of composites with conventional monolithic materials, classification, role of matrix and reinforcement -Reinforcing fibers and Matrix materials. Fabrication processes involved in polymer composites, metal matrix composites, applications in aerospace.

Introduction to modern ceramic materials, cermets, glass ceramics, Carbon/Carbon composites – properties and applications. Introduction to nano composites.

Video link / Additional online information (related to module if any):

https://nptel.ac.in/courses/101/104/101104010/

https://nptel.ac.in/courses/113/107/113107078/

https://nptel.ac.in/courses/113/107/113107078/

Module-5	L1,L2	8Hours

Non Metals in Aircraft construction:

Wood: Types, properties, and applications. Fabric in aircraft construction and specifications. Glues. Glass: Types, properties, and applications.

Plastics &rubber in aircraft: Types, characteristics, and applications.

Video link / Additional online information (related to module if any):

https://www.youtube.com/watch?v=074RceRJphs

Course outcomes:

CO306.1	Apply the knowledge about the phase diagrams and microstructure of alloys.
CO306.2	Explain the applications of Non-ferrous alloys in Aircraft and Aerospace industry.
CO306.3	Gain knowledge about the application of Ferrous alloys in Aircraft construction
CO306.4	Explain the applications of Polymer, Metal matrix composites.
CO306.5	Get adequate understanding about the application of Non-metals in Aircraft construction

Reference Books:	
1	Titterton G F, Aircraft Material and Processes, English Book Store, New Delhi, 5th edition, 1998, ISBN-13: 978-8175980136
2	Introduction to Physical Metallurgy by Sydney Avner, Tata McGraw-Hill Edition 1997.
3	Hill E T, The Materials of Aircraft Construction, Pitman London.
	C G Krishnadas Nair, Handbook of Aircraft materials, Interline publishers, Bangalore, 1993

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks)
SEE Assessment:
xvi.   Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus.
xvii.   Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions.
xviii.   One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	0	1	0	0	0	0	1	1
CO2	3	1	1	0	1	2	0	0	0	0	0	1

CO3	3	2	1	2	0	2	1	0	0	0	1	1
CO4	3	1	1	0	0	1	0	0	0	0	0	1
CO5	3	1	1	1	0	2	0	0	0	0	0	1

High-3, Medium-2, Low-1

Course Title	MEASUREMENT AND METROLOGY LAB	Semester	III
Course Code	MVJ20ASL37A	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	03	Total	100
Credits	02	Exam. Duration	3 Hours

Course objective is to:

- Learn the concepts of mechanical measurements and metrology
- Use the concept of accuracy, error and calibration
- Acquire the knowledge of basic metrological instruments

Sl No	Experiment Name	RBT Level	Hours
1	Calibration of Pressure Gauge	L1,L2,L3	
2	Calibration of Thermocouple	L1,L2,L3	
3	Calibration of LVDT	L1,L2,L3	
4	Calibration of Load cell	L1,L2,L3	
5	Determination of modulus of elasticity of a mild steel specimen using strain gauges.	L1,L2,L3	
6	Comparison and measurements using verniercaliper and micrometer	L1,L2,L3	
7	Measurement of vibration parameters using vibration setup.	L1,L2,L3	
8	Measurements using Optical Projector / Toolmaker Microscope.	L1,L2,L3	
9	Measurement of angle using Sine Center / Sine bar / bevel protractor	L1,L2,L3	
10	Measurement of alignment using Autocollimator / Roller set	L1,L2,L3	
11	Measurement of Screw threads Parameters using Two-wire or Three-wire method.	L1,L2,L3	
12	Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator	L1,L2,L3	

13	Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer	L1,L2,L3	
14	Calibration of Micrometer using slip gauges	L1,L2,L3	

Course outcomes:	
CO1	Use different measuring tools related to experiments
CO2	Identify, define, and explain accuracy, precision, and some additional terminology.
CO3	Conduct, Analyse, interpret, and present measurement data from measurements Identify, define, and explain accuracy, precision, and some additional terminology

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	2	0	0	0	0	0	1	0	0	0
CO2	3	0	1	0	0	0	0	0	1	0	0	0
CO3	3	1	3	0	0	0	0	0	1	0	1	1

High-3, Medium-2, Low-1

Course Title	MATERIAL TESTING LAB	Semester	III
Course Code	MVJ20ASL37B	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	03	Total	100
Credits	02	Exam. Duration	3 Hours

Course objective is to:

- Understand the relations among materials and their properties.
- Comprehend the formation, properties and significance of the alloys through different experiments.
- Acquire the practical knowledge of metallographic testing of engineering materials.
- Understand the various heat treatment process of metals.
- Know the types, advantages and applications of various NDT methods.

Sl No	Experiment Name	RBT Level	Hours
1	Hardness Testing – Vicker's, Brinell, Rockwel	L1,L2,L3	03
2	Tensile Test	L1,L2,L3	03
3	Flexural Test	L1,L2,L3	03
4	Torsional Test	L1,L2,L3	03
5	Impact Test	L1,L2,L3	03
6	Shear Test	L1,L2,L3	03
7	Fatigue Test	L1,L2,L3	03
8	Preparation of specimen for metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & metal matrix composites	L1,L2,L3	03
9	Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.	L1,L2,L3	03
10	To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.	L1,L2,L3	03

11	Visual Testing Technique, Dye penetration testing. To study the defects of Cast and Welded specimens.	L1,L2,L3	03
12	Magnetic Particle Inspection.	L1,L2,L3	03
13	Ultrasonic Inspection.	L1,L2,L3	03

Course outcomes:

CO1	Examine the relations among materials properties.
CO2	Differentiate the formation, properties and significance of the alloys through different experiments.
CO3	Apply the knowledge of metallographic testing in aircraft materials.
CO4	Examine the heat treatment process to improve the properties of aircraft materials.
CO5	Analyze the types, advantages and applications of various NDT methods.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	2	0	0	0	0	0	1	0	0	0
CO2	3	0	1	0	0	0	0	0	1	0	0	0
CO3	3	1	3	0	0	0	0	0	1	0	1	1
CO4	3	0	1	0	0	0	0	0	0	0	1	1
CO5	3	0	2	0	0	0	0	0	1	0	0	0

High-3, Medium-2, Low-1

Course Title	MACHINE SHOP	Semester	III
Course Code	MVJ20AEL38/ASL38	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	03	Total	100
Credits	02	Exam. Duration	3 Hours

Course objective is to:

- Practice general-purpose machine tools and manufacturing process.
- Operate the special purpose machine tools
- Prepare physical models using different manufacturing processes.

Sl No	Experiment Name	RBT Level	Hours
	PART A		
1	Introduction to Machining operations & tools (i.e. Lath machine & shaper machine etc.)	L1,L2,L3	03
2	Machining and machining time estimation for plain turning, taper turning & step turning	L1,L2,L3	03
3	Machining and machining time estimation for thread cutting	L1,L2,L3	03
4	Machining and machining time estimation for knurling	L1,L2,L3	03
5	Machining and machining time estimation for knurling operation	L1,L2,L3	03
6	Machining and machining time estimation for drilling operation	L1,L2,L3	03
7	Machining and machining time estimation for boring operation	L1,L2,L3	03
	PART B		
8	Machining and machining time estimation for internal thread cutting	L1,L2,L3	03
9	Machining and machining time estimation for external thread cutting	L1,L2,L3	03
10	Machining and machining time estimation for eccentric turning	L1,L2,L3	03
11	Machining of hexagon in shaping machine	L1,L2,L3	03
112	Machining of square in shaping machine	L1,L2,L3	03
13	Cutting of gear teeth using milling machine	L1,L2,L3	03

14	Grinding operations using grinding machine	L1,L2,L3	03

Course outcomes:	
CO1	Demonstrate the operation of general purpose machine tools and manufacturing process.
CO2	Identify the special purpose machine tools for specific requirements
CO3	Develop physical models using different mechanical processes.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	0	0	0	0	0	0	0	0
CO2	3	3	3	2	0	0	0	0	0	0	0	0
CO3	3	3	2	1	0	0	0	0	0	0	0	0

High-3, Medium-2, Low-1

Course Title	CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW	Semester	III/IV
Course Code	MVJ20CPH39/49	CIE	50
Total No. of Contact Hours	20 L : T : P :: 1 :0 : 0	SEE	50
No. of Contact Hours/Week	01	Total	100
Credits	01	Exam. Duration	2 hrs

Course objective is to:
➤ To know the fundamental political codes, structure, procedures, powers, and duties of Indian constitution, Indian government institutions, fundamental rights, directive principles and the duties of the citizens.   ➤ To provide overall legal literacy to the young technograts to manage complex societal issues in the present scenario.   ➤ To understand engineering ethics & their responsibilities, identify their individual roles and ethical responsibilities towards society.

Module-1	RBT Level L1,L2,L3	03 Hours

Introduction to Indian Constitution

The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian Constitution, The Making of the Constitution, The role of the Constituent Assembly – Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and Limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and Significance in Nation Building.

Module – II	RBT Level L1,L2,L3	03 Hours

Union Executive and State Executive

Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Article 370, 371, 371J) for some States.

Module – III	RBT Level	03 Hours

		L1,L2,L3	

Elections, Amendments and Emergency Provisions

Elections, Electoral Process, and Election Commission of India, Election Laws.

Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44,61,73,74,75,86, and 91,94,95,100,101,118 and some important Case Studies. Recent Amendments with explanation. Important Judgements with Explanation and its impact on society (from the list of Supreme Court Judgements).

Emergency Provisions, types of Emergencies and it's consequences.

Constitutional Special Provisions:

Special Constitutional Provisions for SC & ST, OBC, Special Provision for Women, Children & Backward Classes.

Module – IV	RBT Level L1,L2,L3	03 Hours

Professional / Engineering Ethics

Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India) : Profession, Professionalism, Professional Responsibility. Clash of Ethics, Conflicts of Interest.

Responsibilities in Engineering - Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility.Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

Module – V	RBT Level L1,L2,L3	03 Hours

Internet Laws, Cyber Crimes and Cyber Laws:

Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship, Cybercrimes and enforcement agencies.

Course Outcomes: On completion of this course, students will be able to	
CO1	Have constitutional knowledge and legal literacy
CO2	Understand Engineering and Professional ethics and responsibilities of Engineers.
CO3	Understand the cyber crimes and cyber laws for cyber safety measure.

Text Books:	
1.	Constitution of India and Professional Ethics, T.S. Anupama, Sunstar Publisher
Reference Books:	
1.	Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th/20thEdn., (Latest Edition) or 2008.
2.	Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" by Cengage Learning India Private Limited, Latest Edition – 2018.
3	M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall of India Pvt. Ltd. New Delhi, 2004.
4.	M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
5.	Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (40 marks each), the final IA marks to be awarded will be the average of three tests - Assignment (10 marks)
SEE Assessment:
xix. Question paper for the SEE consists one part. It is compulsory and consists of objective type 1 mark each for total of 50 marks covering the whole syllabus. xx. Ten questions must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	2	2	1	1	1	1	2
CO2	1	2	2	1	1	2	1	1	1	1	1	2
CO3	2	1	2	1	1	1	1	1	1	1	1	2
CO4	2	2	1	1	1	1	1	1	1	1	1	2
CO5	2	2	1	1	1	2	1	1	1	1	1	2

High-3, Medium-2, Low-1

Course Title	BALIKE KANNADA	Semester	III
Course Code	MVJ20BK39	CIE	50
Total No. of Contact Hours	20 L : T : P :: 1 :0 : 0	SEE	50
No. of Contact Hours/week	01	Total	100
Credits	01	Exam. Duration	3Hrs

Course objective :This course will enable students to understand Kannada and communicate in Kannada language

- Vyavharika Kannada –Parichaya (Introduction to Vyavharikakannada)
- Kannada Aksharamaalehaaguuchcharane(Kannada Alphabets and Pronounciation.
- Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).
- Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)
- Activities in Kannada

CHAPTER-1

Vyavharika Kannada –Parichaya (Introduction to Vyavharikakannada)

CHAPTER-2

Kannada Aksharamaalehaaguuchcharane(Kannada Alphabets and Pronounciation

CHAPTER-3

Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication)

CHAPTER-4

Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)

CHAPTER-5

Activities in Kannada

Scheme of Evaluation:

Details		Marks
Average of three Internal Assessment (IA) Tests of 30 Marks each i.e. Σ (Marks Obtained in each test) / 3	CIE(50)	30
ASSIGNMENT		20
Semester End Examination	SEE (50)	50
	Total	100

Course Title	SAMSKRUTHIKA KANNADA	Semester	III
Course Code	MVJ20SK39	CIE	50
Total No. of Contact Hours	20 L: T: P 1:0:0	SEE	50
No. of Contact Hours/week	1	Total	100
Credits	1	Exam. Duration	3Hrs

Course objective :This course will enable students to understand Kannada and communicate in Kannada language

- Samskruthika Kannada –Parichaya (Introduction to Adalithakannada)
- Kannada Kavyagalaparichaya (Kannada D Ra Bendre, Siddalingaiha)
- Adalithdalli Kannada Padagalu (Kannada KagunithaBalake, Patra Lekhana, Prabhandha)
- Kannada Computer Gnyana (Kannada ShabdhaSangraha, Computer Paribashikapadagalu)
- Activities in Kannada.

CzsÁåAiÀÄ -1
PÀ£ÀßqÀ ¨sÁµÉ-¸ÀAQë¥ÀÛ «ªÀgÀuÉ.

CzsÁåAiÀÄ -2
¨sÁµÁ ¥ÀæAiÉÆÃUÀ¯ÁèèUÀÀªÀÄ ¯ÉÆÃ¥ÀzÉÆÃµÀUÀ¼ÀÄ ªÀÄvÀÄÛ CªÀÅUÀ¼À ¤ªÁgÀuÉ.

CzsÁåAiÀÄ -3
¯ÉÃR£À aºÉßUÀ¼ÀÄ ªÀÄvÀÄÛ CªÀÅUÀ¼À G¥ÀAiÉÆÃU.À

CzsÁåAiÀÄ -4
¥ÀvÀæ ªÀåªÀºÁgÀ.

CzsÁåAiÀÄ -5
DqÀ½vÀ ¥ÀvÀæUÀ¼ÀÄ.

CzsÁåAiÀÄ -6
¸ÀPÁðgÀzÀDzÉÃ±À ¥ÀvÀæUÀ¼ÀÄ

CzsÁåAiÀÄ -7
¸ÀAQë¥ÀÛ ¥Àæ§AzsÀgÀZÀ£É, ¥Àæ§AzsÀ ªÀÄvÀÄÛ ¨sÁµÁAvÀgÀ

CzsÁåAiÀÄ -8
PÀ£ÀßqÀ ±À§Ý¸ÀAUÀæºÀ

CzsÁåAiÀÄ -9
PÀ¥À¬Ælgï ºÁUÀÆ ªÀiÁ»wvÀAvÀæeÁÕ£À

CzsÁåAiÀÄ -10
¥Áj¨sÁ¶PÀ DqÀ½vÀ PÀ£ÀßqÀ ¥ÀzÀUÀ¼ÀÄ ªÀÄvÀÄÛvÀ¼ÀÄªÀÁwæPÀ/PÀA¥À¬Ælgï

¥Áj¨sÁ¶PÀ¥ÀzÀUÀ¼ÀÄ.

Scheme of Evaluation:

Details		Marks
Average of three Internal Assessment (IA) Tests of 30 Marks each i.e. Σ (Marks Obtained in each test) / 3	CIE(50)	30
ASSIGNMENT		20
Semester End Examination	SEE (50)	50
Total		100

Course Title	ADDITIONAL MATHEMATICS-I	Semester	III
Course Code	MVJ20MATDIP31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	-	Exam. Duration	3hrs

Course objective is to: This course viz., aims to prepare the students:

To familiarize the important and basic concepts of Differential calculus and Differential Equation, ordinary/partial differential equations and Vector calculus and analyse the engineeringproblems.

Module-1	L1,L2	8Hrs.

Differential calculus: Recapitulations of successive differentiations -n^{th} derivative -Leibnitz theorem and Problems, Mean value theorem -Rolle's theorem, Lagrange's Mean value theorem , Cauchy's theorem and Taylor's theorem for function of one variables.

Video Link:

https://users.math.msu.edu/users/gnagy/teaching/ode.pdf

Module-2	L1,L2	8 Hrs.

Integral Calculus:

Review of elementary Integral calculus, Reduction formula

$$\int_0^{\frac{\pi}{2}} sin^m x \, dx \quad , \int_0^{\frac{\pi}{2}} cos^m x \, dx \quad , \int_0^{\frac{\pi}{2}} sin^m cos^n x \, dx \qquad \text{and problems.}$$

Evaluation of double and triple integrals and Simples Problems.

Video Link:

https://www.youtube.com/watch?v=rCWOdfQ3cwQ

https://nptel.ac.in/courses/111/105/111105122/

Module-3	L1,L2	8Hrs.

Vector Calculus: Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities - div (φA), curl (φA), curl (grad φ), div (curl A).

Video Link:

https://www.whitman.edu/mathematics/calculus_online/chapter16.html

https://www.math.ust.hk/~machas/vector-calculus-for-engineers.pdf

Module-4	L1,L2,L3	8 Hrs.

Probability:

Introduction-Conditional Probability, Multiplication theorem ,Independent events ,Baye's theorem and Problems.

Video Link:

https://www.khanacademy.org/math/statistics-probability/probability-library

https://nptel.ac.in/courses/111/105/111105041/

Module-5	L1,L2,L3	8 Hrs.

Differential equation: Homogenous differential equation, Linear differential equation, Bernoulli's differential equation and Exact differential equation.

Video Link:

https://www.mathsisfun.com/calculus/differential-equations.html

Course outcomes:	
CO1	Apply the knowledge of Differential calculus in the modeling of various physicaland engineeringphenomena
CO2	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
CO3	Study on Vector calculus to understand the various solution to Application to Engineering problems.
CO4	Understand the basic Concepts of Probability
CO5	Solve first order linear differential equation analytically using standard methods.

Text Books:	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.

Reference Books:	
1.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10thedition,2014.
2.	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

Course Title	UNIVERSAL HUMAN VALUES	Semester	III
Course Code	MVJ20UHV310	CIE	50
Total No. of Contact Hours	20 L : T : P :: 1 : 0 :0	SEE	50
No. of Contact Hours/week	1	Total	100
Credits	1	Exam. Duration	3 Hours

Course objective is to:

- Perceive the need for developing a holistic perspective of life
- Sensitise the scope of life – individual, family (inter-personal relationship), society and nature/existence, Strengthening self-reflection
- Develop more confidence and commitment to understand, learn and act accordingly

Module-1	L1, L2, L3	04 Hours

Welcome and Introductions: Getting to know each other (Self-exploration)

Aspirations and Concerns: Individual academic, career, Expectations of family, peers, society, nation, Fixing one's goals (Basic human aspirations Need for a holistic perspective Role of UHV)

Self-Management:Self-confidence, peer pressure, time management, anger, stress, Personality development, self-improvement (Harmony in the human Being)

Health: Health issues, healthy diet, healthy lifestyle, Hostel life (Harmony of the Self and Body Mental and physical health)

Relationships: Home sickness, gratitude, towards parents, teachers and, others Ragging and interaction, Competition and cooperation, Peer pressure (Harmony in relationship Feelings of trust, respect, gratitude, glory, love)

Society: Participation in society (Harmony in the society)

Natural Environment: Participation in nature (Harmony in nature/existence)

Video link:

1. https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV
2. https://youtube.com/playlist?list=PLYwzG2fd7hzcZz1DkrAegkKF4TseekPFv

Presentation: https://fdp-si.aicte-india.org/AicteSipUHV_download.php

Module-2	L1, L2, L3	04 Hours

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Self-exploration as the Process for Value Education, Happiness and Prosperity – Current Scenario.

Video link:		
1. https://www.youtube.com/watch?v=85XCw8SU084		
2. https://www.youtube.com/watch?v=E1STJoXCXUU&list=PLWDeKF97v9SP_Kt6jqzA3p Z3yA7g_OAQz		
https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-3	**L1, L2, L3**	**04 Hours**
Introduction to Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self, Harmony of the Self with the Body. Video link: 1. https://www.youtube.com/watch?v=GpuZo495F24 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-4	**L1, L2, L3**	**04 Hours**
Introduction to Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society. Video link: 1. https://www.youtube.com/watch?v=F2KVW4WNnS8 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-5	**L1, L2, L3**	**04 Hours**
Introduction to Implications of the Holistic Understanding: Natural Acceptance of Human Values, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Holistic Technologies, Production Systems and Management Models-Typical Case Studies. Video link: 1. https://www.youtube.com/watch?v=BikdYub6RY0 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Course outcomes:		

CO2	Develop a holistic perspective about life
CO3	Explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society as an unit in nature
CO4	Become more responsible in life, and in handling problems with sustainable solutions
CO5	Have better critical ability
	Become sensitive to their commitment

Reference Books:	
1	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	2	2	3	2	1	2	1
CO2	-	1	-	-	-	2	2	3	2	1	2	1
CO3	-	1	-	-	-	2	2	3	2	1	2	1
CO4	-	1	-	-	-	2	2	3	2	1	2	1
CO5	-	1	-	-	-	2	2	3	2	1	2	1

High-3, Medium-2, Low-1