Course Title	FOURIER SERIES , TRANSFORMS, NUMERICAL AND OPTIMIZATION TECHNIQUES	Semester	III
Course Code	MVJ20MCV31	CIE	50
Total No. of Contact Hours	40 L : T : P :: 2 : 2 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3 Hours

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 and Z-Transforms
- Use of statistical methods in curve fitting applications
- Use of numerical methods to solve algebraic and transcendental equations, vector integration and calculus of variation

Module-1	L1,L2 & L3	8 Hours

Laplace Transforms: Definition and Laplace transforms of Elementary functions.
Laplace transforms of $e^{at}f(t), t^n f(t)$ and f(t)/t ,periodic functions and unit step function – problems.

Inverse Laplace Transforms: Inverse Laplace Transforms – Problems, Convolution theorem to find the inverse Laplace transforms and problems, solution of linear differential equations using Laplace Transforms.

Applications: The Laplace transform is particularly useful in solving linear ordinary differential equations.

Module-2	L1,L2 & L3	8 Hours

Fourier Series: Periodic functions, Dirichlet's condition, Fourier Series of periodic functions with period 2π and with arbitrary period $2c$. Fourier series of even and odd functions. Half range Fourier Series, Practical harmonic Analysis.

Applications: The Fourier series has many such applications in harmonic analysis, vibration analysis, acoustics, optics etc.
Video link / Additional online information (related to module if any):
- https://nptel.ac.in/courses/111106111/

Experimental learning(Videos):
- http://esg.mit.edu/videos/fourier-series-modeling-nature/

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 and problems.

Applications: Fourier Transformation (FT) has huge application in studying to study vibrations in building/structures. Any kind of spectroscopy applied in chemical engineering (CE) is based in Fourier techniques.

Module-4	L1,L2 & L3	8 Hours

Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method. Runge - Kutta method of fourth order, Milne's and Adams-Bash forth predictor and corrector methods (No derivations of formulae-single step computation only.

Applications: Numerical Methods are used to provide 'approximate' results for the differential equation problems being dealt with and their necessity is felt when it becomes impossible or extremely difficult to solve a given problem analytically.

Module-5	L1,L2 & L3	8 Hours

Numerical Methods: Numerical solution of second order ordinary differential equations, Runge-Kutta method and Milne's method. (No derivations of formulae-single step computation only).

Optimization Techniques: Linear Programming, Mathematical formulation of linear programming problem (LPP), Types of solutions, Graphical Method, Simplex Method.

Applications: Linear Programming is used in a variety of fields including food and agriculture, engineering, transportation problems, manufacturing and energy.

Course outcomes:	
CO1	Use Laplace transform and inverse transforms techniques in solving differential equations.
CO2	Know the use of periodic signals and Fourier series to analyze circuits and system
CO3	Demonstrate Fourier Transform as a tool for solving Integral equations.
CO4	Identify appropriate numerical methods to solve ODE.
CO5	Solve the mathematical formulation of linear programming problem.

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) Assignments (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.

Text Books:	
1	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition 2013.
2	S. D. Sharma, "Operations Research", Kedar Nath and Ram NathPublishers, Seventh Revised Edition 2014.
Reference Books:	
1	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
2	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition
3	Jain R. K. & Iyengar S.R.K., Advanced Engineering Mathematics, Narosa Publishing House, 2002.

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

High-3, Medium-2, Low-1

Course Title	SOLID MECHANICS	Semester	III
Course Code	MVJ20CV32	CIE	50
Total No. of Contact Hours	50 L : T : P :: 3 : 2 : 0	SEE	50
No. of Contact Hours/week	5	Total	100
Credits	4	Exam. Duration	3 Hrs

Course objective is to:

- Provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and design engineering systems.
- Explain the basic concepts of the stresses and strains for different materials
- State the development of internal forces and resistance mechanism for one dimensional and two-dimensional structural element.
- Evaluate the behaviour of torsional members, columns and struts.

Module-1	L1,L2 & L3	10 Hrs.

Prerequisites: Engineering Mechanics

Concepts of Stress and Strain: Properties of materials, Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety (Online mode), Elongation of uniform bar and tapering bar due to self-weight, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, volumetric strain, expression for volumetric strain, Elastic constants and their relationship.

Laboratory Sessions/ Experimental learning: (Self Learning)

- Determination of Tensile strength of mild steel and HYSD bars by Tension test. (SOLID MECHANICS LABORATORY_MVJ19CVL38_EXPT1)
- Determination of Compressive strength of mild steel, cast iron and wood by Compression test. (SOLID MECHANICS LABORATORY_MVJ19CVL38_ EXPT 2)
- Experimental test on compound section subjected to temperature stresses. (SOLID MECHANICS LABORATORY_MVJ19CVL38_ EXPT 11)
- Computation of Stresses and Deformation of Compound section using

EXCEL Sheet Applications: (Self Learning)

- Understanding the scope of the subject.

- Identifying different material properties.
- Knowledge about Stress-strain characteristics and its practical use.

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105105108/
- https://nptel.ac.in/courses/105/102/105102090/

Module-2	L1,L2 & L3	10 Hrs.

Compound Stresses: Two-Dimensional Stress Problems (Online Mode): Principal stresses, maximum shear stresses, Mohr's circle of stresses and its construction, Theories of failure

Thick and Thin Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume (Online Mode). Thick cylinders: Lame's equation, cylinder's subjected to both internal and external pressure, radial and hoop stress distribution.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Mohr's Circle – Graphical Computation of Principles Stresses
- Computation of Compound Stresses by using Excel Sheet
- Plotting of Radial and Hoop stress distribution using

Excel Sheet Applications: (Self Learning)
- Knowledge about the behaviour and strength of structural elements under the action of compound stresses and thus understand the failure concepts.

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105105108/
- https://nptel.ac.in/courses/105/102/105102090/

Module-3	L1,L2 & L3	10 Hrs.

Beam Statics: Support reactions, Definition of bending moment and shear force, sign conventions, relationship between load intensity, bending moment and shear force (Online Mode). Shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments for determinate beams.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Experimental checking of the behavior of different types of beams subjected to different loads and the Model making of Types of beams & reactions
- Shear force variation with various loading condition (SOLID MECHANICS

LABORATORY_MVJ19CVL38_ EXPT 5)
- Compute the Relationship between Shear force and Bending moment at particular section using Excel Sheet

Applications: (Self Learning)
- Behavior of different types of beams and its reactions.
- Behavior beams subjected various types of loading.

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105105108/
- https://nptel.ac.in/courses/105/102/105102090/

Module-4	L1,L2 & L3	10 Hrs.

Prerequisites: Concept of moment of inertia, Centroid

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity (Online Mode). Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', 'T' and Symmetrical Built-up sections.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Effect of force of different magnitude on the bending stresses in beam (SOLID MECHANICS LABORATORY_MVJ19CVL38_ EXPT 4)
- Develop expression for transverse shear stress in beam using

Excel Sheet Applications: (Self Learning)
- Understanding bending and shear stresses in beams subjected to

simple bending Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105105108/
- https://nptel.ac.in/courses/105/102/105102090/

Module-5	L1,L2 & L3	10 Hrs.

Prerequisites: Concept of power & Torque, Integration

Columns and Struts: Introduction, short and long columns (Online Mode). Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation Introduction, pure torsion, Assumptions (Online Mode), rigidity and polar modulus, Power transmitted by solid and hollow circular shaft.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Model Making of Euler's Buckling load for different end conditions
- Determination of Torsion in a Circular shaft
- Develop Conditional equations for Column Analysis using

Excel Sheet Applications: (Self Learning)
- Understanding short and long columns and its buckling against different end conditions.
- Computation of torsional stress induced in circular members.

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105105108/
- https://nptel.ac.in/courses/105/102/105102090/

Course outcomes: On completion of the course, students would be able to

CO1	Restate the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
CO2	Evaluate the behaviour and strength of structural elements under the action of compound stresses and thus understand the failure concepts.
CO3	Compute shear force and bending moment in loaded statically determinate beams
CO4	Compute bending and shear stresses in beams subjected to simple bending
CO5	Describe the critical buckling load of prismatic columns with different end conditions and able to compute torsional stress induced in circular members

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/Case Studies (10 marks)
- Assignments (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.

Textbooks:	
1.	B.S. Basavarajaiah, P.Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010
2.	R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010

Reference Books:	
1.	D.H. Young, S.P. Timoshenko " Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
2.	S.S. Rattan " Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).
3.	Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi, 2006.
4.	Ferdinand P. Beer, E. Russell Johnston Jr. "Mechanics of Materials", 8th Edition (in SI Units), 2020.

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

High-3, Medium-2, Low-1

Course Title	FLUID MECHANICS	Semester	III
Course Code	MVJ20CV33	CIE	50
Total No. of Contact Hours	40 L : T : P :: 2 : 2 : 0	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	3	Exam. Duration	3 Hrs

Course objective is to:

- Provide the Fundamental properties of fluids and its applications
- Make the students to explain on Hydrostatic laws and application to solve practical problem
- Gain the knowledge on Principles of Kinematics and Hydrodynamics for practical applications.
- Basic design of pipes and pipe networks considering flow, pressure and its losses
- Arrive the basic flow rate measurements

Module-1	L1,L2 & L3	8 Hrs.

Prerequisites: Knowledge on basic Fluid Properties, Newton's Laws

Fluids & Their Properties:

Historical Development of Fluid Mechanics, Concept of fluid, Systems of units, Fluid as a continuum, Properties of fluid - Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Newton's law of viscosity (theory & problems), Cohesion, Adhesion, Surface tension, Pressure inside a water droplet, soap bubble and liquid jet (Online Mode), Numerical problems. Capillarity, Capillary rise in a vertical tube & between two plane surfaces, Numerical problems. Vapour pressure of liquid, Cavitation, Compressibility and bulk modulus.

Fluid Pressure and Its Measurements:

Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth on fluid at rest (Online Mode). Types of pressure. Measurement of pressure using simple, differential & inclined manometers, Numerical problems. Introduction to Mechanical and electronic pressure measuring devices.

Laboratory Sessions/ Experimental learning: (Self Learning)

- Determination of Capillary Rise of water and Capillary fall of mercury in a vertical tube
- Measurement of Pressure in Differential U-tube Mercury Manometer (APPLIED HYDRAULICS LABORATORY_MVJ19CVL47_Expt. No. 1,3 & 4)
- Calculation of pressure under curved surface using Excel Sheet

Applications: (Self Learning)

- Lifting Mechanism of hydraulic Jack and Hydraulic Press
- Pressure in Artesian Wells, Water Tower and Dams Video

link / Additional online information: (Self Learning)

- Fluid Pressure : https://nptel.ac.in/courses/112105171/

Module-2	L1,L2 & L3	8 Hrs.

Prerequisites: Knowledge on Centroid, Moment of Inertia, Knowledge of Calculus, Partial Derivative Equations

Hydrostatic forces on Surfaces: Definition, Total pressure, centre of pressure, total pressure on horizontal, vertical and inclined plane surface submerged in liquid (Online Mode), total pressure on curved surfaces, water pressure on gravity dams, Lock gates, Numerical Problems.

Kinematic Flow: Introduction, Methods of describing fluid motion, types of fluid flow, rate of flow, basic principles of fluid flow, three-dimensional continuity equation in Cartesian coordinate system (Online Mode), Velocity and Total acceleration of a fluid particle, Derivation for Rotational and irrational motion. Potential function, stream function, orthogonality of streamlines and equipotential lines. Numerical problems on Stream function and velocity potential function. Introduction to flow net.

Laboratory Sessions/ Experimental learning: (Self Learning)

- Model Making of Streamline and Potential line under Gravity Dam
- Draw the Flow net diagram for upstream storage of Barrage
- Formulation of Design steps for Lock Gate Analysis using

Excel Sheet Applications: (Self Learning)

- Design of different parts of Hydraulic Equipment
- Pressure on Water Control Structures like Gravity Dam
- Steady Flow Analysis in Turbines

Video link / Additional online information: (Self Learning)

- Kinematic Flow : https://nptel.ac.in/courses/105101082/

Module-3	L1,L2 & L3	8 Hrs.

Prerequisites: Knowledge on basic dynamic principles.

Fluid Dynamics:

Introduction, Forces acting on fluid in motion, Euler's equation of motion along a streamline, Bernoulli's equation, Assumptions and limitations of Bernoulli's equation, Modified Bernoulli's

equation (real fluid) (Online Mode), Numerical Problems (with and without losses). Momentum equation, Numerical problems on pipe bends.

Application of Bernoulli's Equation: Introduction. Venturi meter, Orifice meter, Pitot tube, Numerical Problems.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Model Making Flow through pipe and calculation of energy loss under given slope
- Determine the dimension of parts of Venturimeter for the given discharge (APPLIED HYDRAULICS LABORATORY_MVJ19CVL47_Expt. No. 1)
- Formulate and analyze the pipe bend by momentum equation using

Excel Sheet Applications: (Self Learning)
- Liquid ejection instruments like Paint Gun and Insect-Sprayer
- Dynamic lift acts on the Plane

Video link / Additional online information: (Self Learning)
- Bernoulli's Theorem : https://nptel.ac.in/courses/112105269/

Module-4	L1,L2 & L3	8 Hrs.

Orifice and Mouthpiece:

Introduction, classification (Online Mode), flow through orifice, hydraulic coefficients, experimental determination of hydraulic coefficients, Numerical problems. Mouthpiece, classification, Borda's Mouthpiece (No Numerical problems).

Notches and Weirs:

Introduction, Classification (Online Mode), discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs, submerged weirs, Numerical problems. Ventilation of weirs.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Model Making of Rectangular, Triangular, Trapezoidal and Cippoletti notches under given Discharge (APPLIED HYDRAULICS LABORATORY_MVJ19CVL47_Expt. No. 2)
- Experimental determination of hydraulic coefficients of given vertical orifice (APPLIED HYDRAULICS LABORATORY_MVJ19CVL47_Expt. No. 5)
- Analyze the Cippoletti notch using Excel Sheet

programming Applications: (Self Learning)
- Stream discharge or a River discharge calculation

- Emptying of Fluid Storage Tanks

Video link / Additional online information: (Self Learning)
- Flow Through Orifice and Mouthpieces:
  https://nptel.ac.in/content/storage2/courses/112104118/ui/Course_home-5.htm

Module-5	L1,L2 & L3	8 Hrs.

Flow through Pipes:

Introduction, Major and minor losses in pipe flow (Online Mode), Darcy- Weisbach equation for head loss due to friction in a pipe, Pipes in series, pipes in parallel, equivalent pipe, Head loss due to sudden expansion, contraction, Numerical problems. Hydraulic gradient line, energy gradient line, Numerical problems. Pipe Networks, Hardy Cross method (No Numerical Problems) (Online Mode). **Surge Analysis in Pipes:**
Water hammer in pipes (Online Mode), equations for pressure rise due to gradual valve closure and sudden closure for rigid and elastic pipes, Numerical Problems.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Determination of distribution of flow rate by Hardy Cross Method for a Residential Buildings
- Converting Water supply line into Single Equivalent pipe system
- Formulate Excel Sheet Program for Hardy Cross

Method Applications: (Self Learning)
- Design of Water Supply Network for a Village
- Create a simple Water Pump (Hydraulic Ram)
- Leaks detection in Pipelines
- Identification of enclosed air packets in

pipelines Video link / Additional online information:
(Self Learning)
- Flow Through pipes: https://nptel.ac.in/courses/105101082/

Course outcomes: On completion of the course, students would be able to	
CO1	Recall the fundamental properties of fluids and fluid Continuum
CO2	Solve problems on hydrostatics and kinematic flow
CO3	State the kinematic concepts related to fluid flow
CO4	Apply Bernoulli's principle for Orifice, Mouthpiece, Notches and Weirs.
CO5	Compute the discharge through pipes in a Pipe Network

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/Case Studies (10 marks) • Assignments (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.

Textbooks:	
1.	P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi.
2.	R.K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", 9th Edition, 2015, Laxmi Publications, New Delhi.

Reference Books:	
1.	Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008.
2.	S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi, 2017.
3.	K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd., 2011.
4.	Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, 2015.
5.	J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition, 5th Edition, 2006.

CO-PO Mapping

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

High-3, Medium-2, Low-1

Course Title	GEODETIC INFORMATION	Semester	III
Course Code	MVJ20CV34	CIE	50
Total No. of Contact Hours	40 L : T : P :: 3 : 0 : 0	SEE	50
No. of Contact Hours/week	3	Total	100
Credits	3	Exam. Duration	3 Hrs

Course objective is to:

- Provide basic knowledge about principles of surveying for location, design and construction of engineering projects
- Develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass
- Make students to familiar with cooperative efforts required in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works
- Provide information about new technologies that are used to abstracting the information of
earth surface

Module-1	L1,L2,L3	8 Hrs.

Prerequisites: Basic knowledge of Trigonometry, Geometry, and Integration

Introduction to Surveying

Importance of surveying to Civil Engineering, Concepts of plane and geodetic surveying Principles of surveying –Plans and maps (Online Mode) – Surveying equipment's, Meridians, Bearings, Dip, Declination, Local attraction, Calculation of bearings and included angles.

Compass surveying: Prismatic and surveyor's compasses (Online Mode), temporary adjustments.

Laboratory Sessions/ Experimental learning: (Self Learning)

- Measuring Bearings using Prismatic Compass (GEODETIC INFORMATION PRACTICE_ MVJ19CVL38 _ Expt. No: 3)

Applications: (Self Learning)

- Highway Alignment and Centre line Marking
- Plotting of Existing Layout of a Village / Town

Video link / Additional online information: (Self Learning)

- https://nptel.ac.in/content/storage2/courses/105107122/modules/module10/html/33-16.htm

Module-2	L1,L2,L3	8 Hrs.

Levelling – Principles and basic definitions – Types of Levels – Types of adjustments and objectives – Types of levelling (Online Mode) – Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning Booking of levels – Rise & fall and H. I methods (Numerical)

Areas and volumes: Measurement of area (Online Mode) – by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpson's one third rule, area from co- ordinates, introduction to planimeter, digital planimeter. Measurement of volumes - trapezoidal and Prismoidol formula.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Using Auto level conducting fly, reciprocal and profile levelling in field (GEODETIC INFORMATION PRACTICE _ MVJ19CVL38 _ Expt. No: 7)

Applications: (Self Learning)
- Volume calculations in contour maps

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105107122/
- http://nptel.ac.in/courses/Webcourse
  contents/IIT%20Bombay/Mathematics%20I/ TOC- middle-M8.html

Module-3	L1,L2,L3	8 Hrs.

Theodolite Surveying: Theodolite and types, fundamental axes and parts of theodolite (Online Mode), temporary adjustments of transit theodolite, Horizontal and Vertical angle measurements by repetition and reiteration

Trigonometric levelling: Single and Double plane for finding elevation of objects Computation of distances and elevations using Tacheometric method.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Theodolite surveying conduction in field (GEODETIC INFORMATION PRACTICE _ MVJ19CVL38 _ Expt. No: 10)

Applications: (Self Learning)
- Measuring of angle with and without the help of a theodolite

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105107122/

Module-4	L1,L2,L3	8 Hrs.

Curve Surveying: Curves – Necessity – Types, Simple curves, Elements , Designation of curves, Setting out simple curves by linear methods (numerical problems on offsets from long chord &chord produced method) (Online Mode), Setting out curves by Rankine's deflection angle method (Numerical problems). Compound curves,

Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius). Transition curves Characteristics (Online Mode), numerical problems on Length of Transition curve, Vertical curves –Types – (theory).

Laboratory Sessions/ Experimental learning: (Self Learning)
- Curve designing with necessary

field data Applications: (Self Learning)
- Highways and railways construction

Video link / Additional online information (related to module if any): (Self Learning)
- https://nptel.ac.in/courses/105104101/

Module-5	L1,L2,L3	8 Hrs.

Contours -Contours and their characteristics – Methods of contour plotting (Online Mode) – Interpolation – Grade contour – application of contours. Numerical examples on calculation of reservoir capacity.

Aerial Photogrammetry-Introduction, Uses, Aerial photographs, Definitions, Scale of vertical photograph (Online Mode), Ground Co-ordinates (Numerical), Relief Displacements (Derivation), Ground control, Procedure of aerial survey, overlaps and mosaics, Stereoscopes, Derivation Parallax.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Contour map plotting and calculation of area and volume of an area (GEODETIC INFORMATION PRACTICE _ MVJ19CVL38 _ Expt. No: 9)

Applications: (Self Learning)
- Introduction to new technologies for extracting geodetic information

Video link / Additional online information (related to module if any): (Self Learning)
- https://www.digimat.in/nptel/courses/video/105104167/L04.html
- https://swayam.gov.in/nd1_noc19_ce34/
- https://nptel.ac.in/courses/105103176/

Course outcomes: On completion of the course, students would be able to	
CO1	Execute survey using compass.
CO2	Find the level of ground surface and Calculation of area and volumes
CO3	Operate theodolite for field execution
CO4	Estimate the capacity of reservoir
CO5	Interpret satellite imageries

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/Case Studies (10 marks) • Assignments (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.

Textbooks:	
1.	Dr. B.C. Punmia , Ashok Kumar Jain &Arun Kumar Jain – Surveying I & II , Laxmi publications (P) Ltd , 2005
2.	R.Agor - A Textbook of Surveying and Levelling, Khanna Publishers, 2005

Reference Books:	
1.	S.K. Duggal - Surveying Vol. II, Tata McGraw Hill Ltd ,Reprint 2015
2.	Chang, K , "Introduction to Geographic Information Systems", Tata McGraw-Hill Publishing Co. Ltd, 2008
3.	George Joseph, "Fundamentals of Remote Sensing", University Press, 2003

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

High-3, Medium-2, Low-1

Course Title	GEO-INFORMATICS & LABORATORY	Semester	III
Course Code	MVJ20CV35	CIE	50
Total No. of Contact Hours	40 L : T : P :: 2 : 0 : 2	SEE	50
No. of Contact Hours/week	3	Total	100
Credits	3	Exam. Duration	3 Hrs

Course objective is to:
- Provide the Basic Working Principles of Remote Sensing (RS), Geographic Information System (GIS) and Global Positioning System (GPS)
- Make the students to Achieve the skill on interpretation of images and rectifying the issues
- Gain the knowledge on collection of spatial data and conduct spatial analysis
- Collection of Spatial Data and integration to different forms
- Creating Codes and Attribute Tables for Spatial Analysis

Module-1	L1, L2, L4	14 Hrs.

Prerequisites: Knowledge of Map Scale, Map Projection

Principles of Remote Sensing:

Definition, basic concepts, Advantages and limitations, Remote sensing process, Electromagnetic spectrum-Energy interactions with atmosphere and earth surface features-spectral reflectance of vegetation, soil and water- Classification of sensors-Active and Passive, Resolution-spatial, spectral radiometric and Temporal resolution, Multi spectral scanning-Along track and across track scanning.(Online Mode)

Laboratory Sessions:

Following Experimental Study is to be carried out by using Remote Sensing

1. Introduction to Working Principles of software

2. Arial photograph interpretation

3. Visual interpretation of multispectral image

4. Image rectification

5. Image classification, supervised and unsupervised classifications

6. Image fusion

Applications: (Self Learning)
- Land use pattern of large areas for regional development

- Whether Forecasting
- Study of Natural Hazards like earthquake, landslides

and floods Video link / Additional online information: (Self Learning)

- Basic Concepts of Remote Sensing: https://nptel.ac.in/courses/105108077/
- Different platform of Remote Sensing: https://nptel.ac.in/courses/121107009/

Module-2	L1, L2, L4	13 Hrs.

Principles of Geographic Information Systems (GIS):

Prerequisites: Knowledge of Basic key operations in Software

Definition, Components of GIS, GIS operations, Map projections- methods, Coordinate systems- Geographic and Projected coordinate systems, Data Types- Spatial and attribute data, Fundamentals of Data Storage, Image storage formats, Data retrieval, Data compression, Raster and vector data representation-Data Input methods-Geometric Transformation-RMS error, Vector data Analysis- buffering, overlay, GIS and Remote Sensing data Integration, Thematic Mapping , GIS and Integration of other types of data. (Online Mode)

Laboratory Sessions:

Following Experimental Study is to be carried out by using GIS

1. Introduction to Working Principles of software
2. Analog to Digital Conversion – Scanning methods
3. Digital database creation – Point features, Line features, Polygon features
4. Data Editing-Removal of errors – Overshoot & Undershoot, Snapping
5. Data Collection and Integration, Non-spatial data attachment working with tables
6. Dissolving and Merging
7. Clipping, Intersection and Union
8. Buffering techniques
9. Spatial and Attribute query and Analysis
10. Contouring and DEM
11. Demo on QGIS (Open Source Software)

Applications: (Self Learning)
- Environmental Impact Analysis
- Agricultural Applications
- Disaster Management and Mitigation

Video link / Additional online information: (Self Learning)

- Introduction to GIS: https://nptel.ac.in/courses/105102015/
- Map Projections: https://nptel.ac.in/courses/105107155/

Module-3	L1, L2, L4	13 Hrs.

Prerequisites: Knowledge on Basic Geography

Basics of Global Positioning System(GPS):

Introduction, Fundamentals of Geodesy, Geoid, Reference Ellipsoid, Satellite constellation, GPS signals and data, Geo-positioning, Control Segment, Space Segments, User Segment, GPS Positioning Types- Absolute Positioning, Differential positioning, Methods, Selection of Reference Station, Reference Station Equipment- GPS receiver, GPS antenna. Radio and its types, Radio Antenna. Introduction to PYTHON (Online Mode)

Laboratory Sessions:

Following Experimental Study is to be carried out by using GPS

1. Introduction to Working Principles of GPS and its initial setting
2. Creating codes and attribute table for GPS receiver
3. Point Data collection using GPS with different datum
4. Line data collection using GPS and measurements
5. GPS data collection for area calculation
6. GPS and GIS integrations output preparation
7. Observations using GPS (Virtual Lab)

Applications: (Self Learning)
- Commercial Fleet Management
- Guide and track heavy vehicles
- In-car Navigation

Video link / Additional online information: (Self Learning)
- Introduction to GPS: https://nptel.ac.in/courses/105107062/
- Measurement using GPS: http://sl-iitr.vlabs.ac.in/exp11/index.php

Course outcomes: On completion of the course, students would be able to	
CO1	Restate the Working Principles of Remote Sensing, GIS and GPS
CO2	Read and interpret the Aerial Photographs
CO3	Prepare the Digital Database and perform its integration
CO4	Develop the contour map and Digital Elevation model
CO5	Create codes and attribute tables for spatial analysis

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/Case Studies (10 marks) • Assignments (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.

Textbooks:	
1.	Jensen, J.R., "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi, 2000.
2.	George Joseph, "Fundamentals of remote sensing", Universities press (India) Pvt. Ltd., Hyderabad, 2003.

Reference Books:	
1.	Kang-tsung Chang, "Introduction to Geographic Information Systems" Tata McGraw Hill,New Delhi, 2002.
2.	C.P.Lo and Albert K.W.Yeung "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India, New Delhi, 2005.
3.	Terry-Karen Steede, "Integrating GIS and the Global Positioning System", ESRI Press, 2002

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

High-3, Medium-2, Low-1

Course Title	BUILDING MATERIALS AND CONSTRUCTION	Semester	III
Course Code	MVJ20CV36	CIE	50
Total No. of Contact Hours	40 L : T : P :: 3 : 0 : 0	SEE	50
No. of Contact Hours/week	3	Total	100
Credits	3	Exam. Duration	3 Hrs

Course objective is to:
- Recognize the good materials for the building construction
- Supervise different types of masonry
- Select type of materials, design and supervise suitable types of walls, floor and roof.
- Gain knowledge about plastering, damp proofing, formwork, scaffolding, shoring and underpinning with suitable engineering measures.

Module-1	L1,L2,L3	8 Hrs.

Prerequisites: Elements of Civil Engineering

Functions of buildings and structure in general - Various components of a building (Online mode) - Loads on buildings as per IS 875, IS 1893 and NBC.

Building Materials: Bricks, Cement concrete blocks, stabilized mud blocks, AAC blocks and mortar for masonry - Additives for mortar (Online mode) - IS recommendations for mortar - Stones and timber- requirements - Concrete-ingredients - Sustainable materials and alternatives.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Verification of dimensions of different types of brick
- Determination of water absorption of brick
- Determination of efflorescence of brick
- Find the soundness and hardness of

brick Applications: (Self Learning)
- Assess quality of bricks

Video link / Additional online information: (Self Learning)
- Masonry materials: https://nptel.ac.in/courses/105102088/ Module 1, 2 and Module 10

Module-2	L1,L2,L3	8 Hrs.

Masonry: Definition and terms used in masonry. Strength of masonry. Brick masonry- characteristics and requirements of good brick masonry (Online mode), Bonds in brick work,

Header, Stretcher, English, Flemish bond- Stone masonry- Requirements of good stone masonry, Classification- Ashlar, Rubble- coursed, uncoursed - Joints in stone masonry - Types of walls.

Laboratory Sessions/ Experimental learning: (Self Learning)
- Arrange bricks according to different bonds- Header, stretcher, English and Flemish. Identify various types of stone masonry in the campus.

Applications: (Self Learning)
- Select suitable masonry for a structure.

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105102088/ Module 10.

Module-3	L1,L2,L3	8 Hrs.

Plastering and Pointing: Mortar for masonry (Types and Uses), Purpose, Materials and method of plastering and pointing. Defects in Plastering.

Painting: Purpose, Types, Technical terms, ingredients, and Defects. Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

Varnish: Characteristics and Types

Laboratory Sessions/ Experimental learning: (Self Learning)
- Assess the quality of different surfaces

Applications: (Self Learning)
- Select suitable methods of painting in various surfaces

Video link / Additional online information: (Self Learning)
- https://nptel.ac.in/courses/105102088/ Module 10

Module-4	L1,L2,L3	8 Hrs.

Formwork: Introduction to form work, mivan shuttering; Scaffolding – Types. Shoring, Under pinning.

Roof : functions, flat roof, pitched roof, roofing materials.

Damp proofing in ground floor, Floor- flooring materials, Thermal performance, fire resistance and acoustics of buildings (Online mode).

Laboratory Sessions/ Experimental learning: (Self Learning)
- Diagnose causes of dampness in a building.

Applications: (Self Learning)
- Select suitable roofing material, flooring material and other materials according to the requirement.
- Take suitable measures to improve functional performance and durability of structure.

Video link / Additional online information: (Self Learning)		
• https://nptel.ac.in/courses/105102088/ Module 10.		
Module-5	L1,L2,L3	8 Hrs.

Sustainable materials and alternatives - Cement concrete blocks, stabilized mud blocks, AAC blocks

Steel in construction – Factors affecting physical properties, uses, market forms of steel.

Plastic-classification, properties, FRP

Glass- Composition, Manufacturing and varieties of glass

Laboratory Sessions/ Experimental learning: (Self Learning)
  • Identify various materials used in the residential building and institutional building.

Applications: (Self Learning)
  • Select suitable sustainable materials for construction

Video link / Additional online information: (Self Learning)
  • https://nptel.ac.in/courses/105102088/ Module 11, 12, 13 and 14

Course outcomes: On completion of the course, students would be able to

CO1	Select suitable materials for buildings and adopt suitable construction techniques.
CO2	Identify various components and requirement needed for building construction.
CO3	Assess strength and stability of masonry.
CO4	Design masonry wall.
CO5	Diagnose problems and suitable repair and maintenance work to enhance durability of buildings.

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/Case Studies (10 marks)
  • Assignments (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.	
Textbooks:	
1.	Dr. B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd.,2005, New Delhi.
2.	Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015, Standard Publishers.

Reference Books:	
1.	Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH, 1987.
2.	Henry, A.W., "Structural Masonry", Macmillan Education Ltd., 1990.
3.	M. L. Gambhir, "Building and Construction Materials", McGraw Hill education Pvt. Ltd
4.	S.K.Duggal, "Building Materials", (Fourth Edition)New Age International (P) Limited, 2016.
5.	IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi.
6.	SP 20 (S&T) – 1991, "Handbook on masonry design and construction (1st revision) BIS, New Delhi.

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

High-3, Medium-2, Low-1

Course Title	GEODETIC INFORMATION PRACTICE	Semester	III
Course Code	MVJ20CVL37	CIE	50
Total No. of Contact Hours	L : T : P :: 0 : 2 : 2	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	2	Exam. Duration	3 Hrs

Course objective is to:
• Apply the basic principles of engineering surveying and measurements • Follow effectively field procedures required for a professional surveyor • Use techniques, skills, and conventional surveying instruments necessary for engineering practice.

Prerequisites: Theory of levelling, ranging concepts, compass surveying

S.NO	Experiments	L3,L4
1	a) Measurements of distances using tape along with horizontal planes and slopes, direct ranging. b) Setting out perpendiculars. Use of cross staff, optical square.	
2	Identification of Obstacles in chaining and ranging – Chaining but not ranging, ranging but not chaining, both ranging and chaining.	
3	Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass. (GEODETIC INFORMATION_MVJ19CV34_ Module 1)	
4	Measurement of bearings of sides of a closed traverse and adjustment of closing error by Bowditch method.	
5	Determination of distance between two inaccessible points using compass and accessories	
6	Determination of reduced levels of points using dumpy level/auto level (simple leveling)	
7	Determination of reduced levels of points using dumpy level/auto level (differential leveling and inverted leveling) (GEODETIC INFORMATION_MVJ19CV34_ Module 2)	

8	Determination of difference in elevation between two points using Reciprocal leveling and to determine the collimation error
9	Conducting profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block level and contour by using Total Station (GEODETIC INFORMATION_MVJ19CV34_ Module 5)
10	Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using theodolite. (GEODETIC INFORMATION_MVJ19CV34_ Module 3)
11	Determination of horizontal distance and vertical height to a base inaccessible object using theodolite by single plane and double plane method.
12	Determination of distance and elevation using tachometric surveying with horizontal and inclined line of sight.
13	Conducting Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule.
14	Demonstration of Minor instruments like Clinometer, Ceylon Ghat tracer, Box sextant, Hand level, Planimeter, nautical sextant and Pentagraph.
15	Plotting of Layout for the Street by using Plane Table Survey

Video link / Additional online information: (Self Learning)
- http://sl-iitr.vlabs.ac.in

Course outcomes: On completion of the course, students would be able to

CO1	Apply the basic principles of engineering surveying and for linear and angular measurements.
CO2	Comprehend effectively field procedures required for a professional surveyor.
CO3	Use techniques, skills, and conventional surveying instruments necessary for engineering practice

Scheme of Evaluation

Regular Lab work and Writing Lab records	(20+15) = 35 marks
Lab test and Viva-voce at the end of the semester	(10+5) = 15 marks
Total	50 marks

Textbooks:

1.	B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.

2.	S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.

Reference Books:

1.	Kanetkar T P and S V Kulkarni , Surveying and Levelling Part I, Pune Vidyarthi Griha Prakashan, 1988
2.	K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. – 2010

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CO-PO
Mapping

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

High-3, Medium-2, Low-1

Course Title	SOLID MECHANICS LABORATORY	Semester	III
Course Code	MVJ20CVL38	CIE	50
Total No. of Contact Hours	L : T : P :: 0: 2 : 2	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	2	Exam. Duration	3 Hrs

Course objective is to:

- Apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
- Function on multi-disciplinary teams in the area of materials testing.
- Understanding of professional and ethical responsibility in the areas of material testing.
- Effectively communicate the mechanical properties of materials.

Prerequisites: Material properties, theory of stress & strain

S.NO	Experiments	L3,L4
1	Determination of Tensile strength of mild steel and HYSD bars by Tension test (SOLID MECHANICS_ MVJ19CV32_Module 1)	
2	Determination of Compressive strength of mild steel, cast iron and wood by Compression test (SOLID MECHANICS_ MVJ19CV32_Module 1)	
3	Estimation of Torsional strength by Torsion test on mild steel circular sections. (SOLID MECHANICS_ MVJ19CV32_Module 5)	
4	Conducting Bending Test on Wood Under two point loading. (SOLID MECHANICS_ MVJ19CV32_Module 4)	
5	Conducting Shear Test on Mild steel- single and double shear. (SOLID MECHANICS_ MVJ19CV32_Module 3)	
6	Determination of Impact strength by Impact test on Mild Steel (Charpy&Izod).	
7	Estimation of surface resistance by Hardness tests on ferrous and non-ferrous metals-Brinell's, Rockwell and Vicker's.	
8	Determination of Strength of Bricks & Tiles.	
9	Demonstration of Strain gauges and Strain indicators. (SOLID MECHANICS_MVJ19CV32_Module 1)	

Video link / Additional online information: (Self Learning)

- http://sm-nitk.vlabs.ac.in

Course outcomes: On completion of the course, students would be able to

CO1	Reproduce the basic knowledge of mathematics and engineering in finding the

	strength in tension, compression, shear and torsion
CO2	Identify, formulate and solve engineering problems of structural elements subjected to flexure.
CO3	Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials

Scheme of Evaluation

Regular Lab work and Writing Lab records	(20+15) = 35 marks
Lab test and Viva-voce at the end of the semester	(10+5) = 15 marks
Total	50 marks

Textbooks:	
1.	Kukreja C B, Kishore K. and Ravi Chawla "Material Testing Laboratory Manual", Standard Publishers & Distributors 1996.
2.	M L Gambhir and NehaJamwal, "Building and construction materials-Testing and quality control", McGraw Hill education(India)Pvt. Ltd., 2014

Reference Books:	
1.	Holes K A, "Experimental Strength of Materials", English Universities Press Ltd. London.
2.	Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition – McGraw Hill Book Co. New Delhi.

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

High-3, Medium-2, Low-1

Course Title	SAMSKRUTHIKA KANNADA	Semester	III
Course Code	MVJ20SK39	CIE	50
Total No. of Contact Hours	15 L : T : P :: 1 : 0 : 0	SEE	50
No. of Contact Hours/week	1	Total	100
Credits	1	Exam. Duration	2 Hrs

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

- Samskruthika Kannada –Parichaya (Introduction to Adalitha kannada)
- Kannada Kavyagala parichaya (Kannada D Ra Bendre, Siddalingaiha)
- Adalithdalli Kannada Padagalu (Kannada Kagunitha Balake, Patra Lekhana, Prabhandha)
- Kannada Computer Gnyana (Kannada Shabdha Sangraha, Computer Paribashika padagalu)
- Activities in Kannada.

Module - 1	L1	3 Hrs

೧. ಕನ್ನಡ ಭಾಷೆ-ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ.

2. ಭಾಷಾ ಪ್ರಯೋಗಗಳ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ

Module - 2	L1	3 Hrs

೧. ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ

2. ಪತ್ರ ವ್ಯವಹಾರ.

Module - 3	L1	3 Hrs

೧. ಆಡಳಿತ ಪತ್ರಗಳು.

2. ಸರ್ಕಾರದಆದೇಶ ಪತ್ರಗಳು

Module - 4	L1	3 Hrs

೧. ಸಂಕೀಪ್ತ ಪ್ರಬಂಧರಚನೆ, ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ

2. ಕನ್ನಡ ಶಬ್ದಸಂಗ್ರಹ

Module - 5	L1	3 Hrs

೧. ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿತಂತ್ರಜ್ಞಾನ

2. ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ/ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು.

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 / Case Studies / Quiz		20
Semester End Examination	SEE (50)	50
	Total	100

Textbooks:	
1.	Adalitha Kannada – Dr. L Thimmesh, Prof. V Keshav Murthy

Course Title	**BALIKE KANNADA**	Semester	III
Course Code	MVJ20BK39	CIE	50
Total No. of Contact Hours	15 L : T : P :: 1 : 0 : 0	SEE	50
No. of Contact Hours/week	1	Total	100
Credits	1	**Exam. Duration**	2 Hrs

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

- Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada)
- Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronunciation.
- Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).
- Kannada Grammar in Conversations(Sambhasaneyalli Kannada Vyakarana)
- Activities in Kannada

Module – 1	L1	3 Hrs
Vyavharika Kannada –Parichaya (Introduction to Vyavharika Kannada)		
Module – 2	L1	3 Hrs
Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronunciation)		
Module – 3	L1	3 Hrs
Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).		
Module – 4	L1	3 Hrs
Kannada Grammar in Conversations(Sambhasaneyalli Kannada Vyakarana)		
Module – 5	L1	3 Hrs
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 / Case Studies / Quiz		20
Semester End Examination	SEE (50)	50
	Total	100

Textbooks:	
1.	Adalitha Kannada – Dr. L Thimmesh, Prof. V Keshav Murthy

Course Title	UNIVERSAL HUMAN VALUES I	Semester	III
Course Code	MVJ20UHV310	CIE	50
Total No. of Contact Hours	15 L: T : P :: 1 : 0 :0	SEE	50
No. of Contact Hours/week	1	Total	100
Credits	1	Exam. Duration	2 Hrs.

Course objective is to: This course will enable the students 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	3 Hrs

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

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

Module-2	L1,L2	3 Hrs

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:
• https://www.youtube.com/watch?v=85XCw8SU084
• https://www.youtube.com/watch?v=E1STJoXCXUU&list=PLWDeKF97v9SP_Kt6jqzA3p Z3yA7g_OAQz
• https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

Module-3	L1,L2	3 Hrs

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:
• https://www.youtube.com/watch?v=GpuZo495F24
• https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

Module-4	L1,L2	3 Hrs

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:
• https://www.youtube.com/watch?v=F2KVW4WNnS8
• https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

Module-5	L1,L2	3 Hrs

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:
• https://www.youtube.com/watch?v=BikdYub6RY0
• https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

Course outcomes: On completion of the course, students would be able to	
CO1	Develop a holistic perspective about life
CO2	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
CO3	Become more responsible in life, and in handling problems with sustainable solutions
CO4	Have better critical ability
CO5	Become sensitive to their commitment

Scheme of Evaluation			
Details		Marks	
CIE (Average of three IA each carries 40 Marks)	CIE(50)	40	
Activities / Assignment		10	
Semester End Examination	SEE (50)	50	
	Total	100	

Text Books:

1.	AICTE SIP UHV-I Teaching Material, https://fdp-si.aicte india.org/ AicteSipUHV _download.php
2.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
3.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

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.
4.	The Story of Stuff (Book).
5.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

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

Course Title	ADDITIONAL MATHEMATICS-I (Common to all branches)	Semester	III
Course Code	MVJ20MATDIP31	CIE	50
Total No. of Contact Hours	40 L:T:P :: 2:1:0	SEE	50
No. of Contact Hours/week	3	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 engineering problems.

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

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

Evaluation of double and triple integrals and Simples Problems.

Video Link:

- 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://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 physical and engineering phenomena
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.

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)
    - Assignments (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.

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, 10th edition,2014.
2.	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

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

High-3, Medium-2, Low-1