Course Title	**SOLID MECHANICS**	Semester	III
Course Code	MVJ19CV32	**CIE**	50
Total No. of Contact Hours	60 L : T : P :: 40 : 10 : 10	**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	**L3**	**12 Hrs.**

Pre requisites: Engineering Mechanics, Concept of Integration

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, Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, 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	L3	12 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	L3	12 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 beam subjected to different loads and the Model making of Types of beams & reactions
- Shear force variation with various loading condition (SOLID MECHANICS

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

Applications: (Self Learning)

- Behaviour of different types of beams and its reactions.
- Behaviour 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	L3	12 Hrs.

Pre requisites: Concept of moment of inertia

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	L3	12 Hrs.

Pre requisites: Concept of power & Torque

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), derivation 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 (SOLID MECHANICS LABORATORY_MVJ19CVL38_ EXPT 3)
- 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

Reference Books:

1.	B.S. Basavarajaiah, P.Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010
2.	D.H. Young, S.P. Timoshenko " Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
3.	R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010
4.	S.S. Rattan " Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).
5.	Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi, 2006.

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	MVJ19CV33	**CIE**	50
Total No. of Contact Hours	60 L : T : P :: 40 : 10 : 10	**SEE**	50
No. of Contact Hours/week	3	**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	**L3**	**12 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

Module-2	L3	12 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.

Module-3	L3	12 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. Venturimeter, 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	L3	12 Hrs.

Orifice and Mouth piece:

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 calculations

Module-5	L3	12 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.

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

Reference Books:	
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 Text book of Fluid Mechanics and Hydraulic Machines", 9th Edition, 2015, Laxmi Publications, New Delhi.
3.	Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008.
4.	S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi, 2017.
5.	K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd., 2011.
6.	Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, 2015.
7.	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	MVJ19CV34	**CIE**	50
Total No. of Contact Hours	60 L : T : P :: 40 : 10 : 10	**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	**L3**	**12 Hrs.**

Introduction to Surveying

Importance of surveying to Civil Engineering ,Concepts of plane and geodetic surveying Principles of surveying –Plans and maps (Online Mode) – Surveying equipments, 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	**L3**	**12 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 prismoidal 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	**L3**	**12 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	**L3**	**12 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 Rankines 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/
- https://www.youtube.com/watch?v=3rvPfIT3Wro

Module-5	L3	12 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

Reference Books:	
1.	Dr. B.C. Punmia , Ashok Kumar Jain &Arun Kumar Jain – Surveying I & II , Laxmi publications (P) Ltd , 2005
2.	R.Agor - A Text book of Surveying and Levelling, Khanna Publishers, 2005
3.	S.K. Duggal - Surveying Vol. II, Tata McGraw Hill Ltd ,Reprint 2015
4.	Chang,K , "Introduction to Geographic Information Systems", Tata McGraw-Hill Publishing Co. Ltd, 2008
5.	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	MVJ19CV35	**CIE**	50
Total No. of Contact Hours	60 L : T : P :: 30 : 00 : 30	**SEE**	50
No. of Contact Hours/week	4	**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	**L3, L5**	**20 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	L3, L5	20 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	L3, L5	20 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

Reference Books:	
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.
3.	Kang-tsung Chang, "Introduction to Geographic Information Systems" Tata McGraw Hill, New Delhi, 2002.
4.	C.P.Lo and Albert K.W.Yeung "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India, New Delhi, 2005.
5.	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	MVJ19CV36	**CIE**	50
Total No. of Contact Hours	60 L : T : P :: 40 : 00 : 20	**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 damp proofing, formwork, scaffolding, shoring and underpinning with suitable engineering measures.

Module-1	**L3**	**12 Hrs.**

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	**L3**	**12 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.

Module-3	L3	12 Hrs.

Strength and stability of masonry: Strength and stability of axially loaded masonry walls, effect of unit strength (Online mode), mortar strength, joint thickness, compressive strength formula.

Permissible stress in masonry: permissible compressive stress, slenderness and eccentricity, stress reduction and shape modification factors (Online mode), increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses. Problems.

Module-4	L3	12 Hrs.

Horizontal loading on walls, modes of failure.

Earthquake resistant construction: Strategy for seismic resistance (Online mode) -Mortars, openings, bands, vertical steel.

Functional performance of buildings: thermal performance, fire resistance and acoustics (Online mode).

Defects and durability of walls: Defects in walls (Online mode). Dampness in basement walls, bypassing, typical diagnosis of dampness problems, Types of cracks in walls, spalling, surface disintegration and other defects.

Module-5	**L3**	**12 Hrs.**

Metals, alloys -fundamentals, microstructure, metallic structures, strengthening mechanisms. Effect of alloying.

Steel in construction-structural steels, types, treatments. Uses in rebar.

Polymer in construction and uses.

Glass and timber.

Roof and floor construction: functions, flat roof, pitched roof, roofing materials. Damp proofing in ground floor, flooring materials

Formwork: Introduction to form work, mivan shuttering, scaffolding, shoring, under pinning.

Asthetic materials in construction, Painting Materials, Fire-Retardant and Thermally insulating Phenolic -Silica Aerogels (Online mode).

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.

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.	Dr.B.C.Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd.,2005, New Delhi.
6.	Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015, Standard Publishers.
7.	IS 1905–1987 "Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi.
8.	SP 20 (S&T) – 1991, "Hand book 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	MVJ19CVL37	**CIE**	50
Total No. of Contact Hours	01 Hour Tutorial (Instruction) 03 Hours Laboratory	**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

Reference Books:

1.	B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.
2.	Kanetkar T P and S V Kulkarni , Surveying and Levelling Part I, Pune VidyarthiGrihaPrakashan, 1988
3.	S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.
4.	K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. – 2010

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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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	MVJ19CVL38	**CIE**	50
Total No. of Contact Hours	01 Hour Tutorial (Instruction) 03 Hours Laboratory	**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.
- Communicate effectively 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 four 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 Flexural Strength of Bricks, Tiles and Concrete Blocks.	
9	Conducting Tests on Fine aggregates-Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking.	
10	Conducting Tests on Coarse aggregates-Absorption, Moisture content, specific gravity,	

	Bulk density and Sieve analysis.
11	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

Reference Books:	
1.	Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition – McGraw Hill Book Co. New Delhi.
2.	M L Gambhir and NehaJamwal, "Building and construction materials-Testing and quality control", McGraw Hill education(India)Pvt. Ltd., 2014
3.	Holes K A, "Experimental Strength of Materials", English Universities Press Ltd. London.
4.	Kukreja C B, Kishore K. and Ravi Chawla "Material Testing Laboratory Manual", Standard Publishers & Distributors 1996.

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	-	-	-
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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