B.V.V.Sangha's

Basaveshwar Engineering College

Bagalkote– 587103

Bachelor of Engineering

Scheme of Teaching and Examination For 2024–25 Admitted Batch onwards

Department of Civil Engineering

Proposed Proposed Curriculum Framework for BE Program (for the Students admitted to to first year from 2024-2025 onwards and to 2nd year lateral entry from 2025-2026 onwards)					
S.No.	**Category**	**VTU**	**AICTE**	**BEC Present**	**BEC Revised**
1.	**HSMC:** HSS (English:2, Kannada:1, UHV,: 1 Constitution:1, EV:1), HRM:3 (Offered by Dept) = 9 AEC (Scientific foundations of Health: 1, Innovation and design Thinking: 1, SS:2, IKS: 1, MOOCS: 3) = 08	**14+8 =22**	**15**	**9+10 =19**	**9+8 =17**
2.	**BSC:** Basic Science Courses (Physics, Chemistry and Mathematics)	**22**	**23**	**22**	**22**
3.	**ESC/ETC:** Engineering Science Courses (Basic Elect/Electronics/Computer/Mechanics/Workshop/Drawing etc.)	**18**	**17**	**18**	**18**
4.	**PCC:** Professional Core Courses	**57**	**61**	**56**	**61**
5.	**PEC:** Professional Elective Courses relevant to the branch with at least one course either fully or partially supported by industry	**12**	**12**	**12**	**12**
6.	**OEC**: Open Electives Courses/ Subjects from other technical/Arts/Commerce (3 MOOCS + 6)	**9**	**12**	**09**	**09**
7.	Mini (2) and Major projects (9) and Industrial Internships (10)	**20**	**20**	**24**	**21**
8.	Mandatory Course: PE, Yoga, NSS, Bridge course Maths 1 and 2 (lateral Entry)	**00**	**00**	**00**	**00**
	Total	**160**	**160**	**160**	**160**

Suggestive Break-up of Credits for B.E (Common to all Branches)

(For the Students admitted to first year from 2024-2025 onwards and to 2nd year lateral entry from 2025-2026 onwards)

Sem.	BSC	ESC/ETC	HSMC	AEC	PCC	PEC	OEC	Proj.	Int.	Total
1.	08	09	02	1(SFH)						**20**
2.	08	09	02	1(IDT)						**20**
3.	03				17					**20**
4.	03		01		16					**20**
5.			01	2 (SS)	09	03	03	02		**20**
6.				1(IKS)	13	03	03			**20**
7.			03		06	06		09		**24**
8.				3 (MOOCS)			3 (MOOCS)		10	**16**
Tot.	**22**	**18**	**09**	**08**	**61**	**12**	**09**	**11**	**10**	**160**
%	**13.75**	**11.25**	**5.62**	**5.0**	**38.12**	**7.5**	**5.63**	**6.87**	**6.25**	**100**

Basaveshwar Engineering College, Bagalkote

B.E–2nd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) 2025-26 Academic Year

III- Semester **Branch:Civil Engineering**

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1	BSC	BMAC301C	Mathematics –III for Civil Engineering Stream	Mathematics	3	0	0	50	50	100	**3**
2	PCC	BCVA302C	Mechanics of Materials	Civil Engineering	3	0	0	50	50	100	**3**
3	PCC	BCVA303C	Surveying	Civil Engineering	3	0	0	50	50	100	**3**
4	PCC	BCVA304C	Concrete Technology	Civil Engineering	3	0	0	50	50	100	**3**
5	PCC	BCVA305C	Building Materials and Construction Technology	Civil Engineering	2	0	0	50	50	100	**2**
6	PCC	BCVA306C	Engineering Geology	Civil Engineering	3	0	0	50	50	100	**3**
7	PCC	BCVA307L	Engineering Geology Lab	Civil Engineering	0	0	2	50	50	100	**1**
8	PCC	BCVA308L	Building Planning and drawing using CAD	Civil Engineering	0	0	2	50	50	100	**1**
9	PCC	BCVA309L	Basic materials and concrete testing lab	Civil Engineering	0	0	2	50	50	100	**1**
10	MC		Bridge Course Mathematics-I	Mathematics	3	0	0	50	50	100	**0**
11	MC	BHSA360M/ BHSB360M/ BHSC360M/	Yoga-1 NSS-1 PE-1	Humanities	-	-	2	-	100	100	**0**
					20	**0**	**8**	**500**	**500**	**1000**	**20**

Basaveshwar Engineering College, Bagalkote

B.E–2nd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) 2025-26 Academic Year

IV- Semester **Branch: Civil Engineering**

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	BSC	BBTA405C	Biology for Engineers	Biotechnology	3	0	0	50	50	100	**3**
2.	PCC	BCVA402C	Analysis of Statically Determinate Structures	Civil Engineering	3	0	0	50	50	100	**3**
3.	PCC	BCVA403C	Soil Mechanics	Civil Engineering	3	0	0	50	50	100	**3**
4.	PCC	BCVA404C	Highway Engineering	Civil Engineering	3	0	0	50	50	100	**3**
5	PCC	BCVA405C	Fluid Mechanics & Hydraulics	Civil Engineering	4	0	0	50	50	100	**4**
6	PCC	BCVA406L	Surveying practice Lab	Civil Engineering	0	0	2	50	50	100	**1**
7	PCC	BCVA407L	Highway Materials Testing Lab	Civil Engineering	0	0	2	50	50	100	**1**
8	PCC	BCVA408L	Fluid Mechanics Lab	Civil Engineering	0	0	2	50	50	100	**1**
9	HSMC	BHSA424C	UHV-II	Humanities / Civil Engg.	1	0	0	50	50	100	**1**
10	BSC		Bridge Course Mathematics-I	Mathematics	3	0	0	50	50	100	**0**
11	MC	**BHSA460M/B460M/C460M/D460M**	Yoga-2/NSS-2/PE-2/Music-2	Humanities	-	-	-	-	-	-	**0**
					20	**0**	**6**	**500**	**500**	**1000**	**20**

Basaveshwar Engineering College, Bagalkote

B.E–3rd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) Semester (2026-27 Academic Year)

Branch: Civil Engineering

V Semester

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	PCC	BCVA501C	Water Treatment and Supply Engineering	Civil Engineering	3	0	0	50	50	100	**3**
2.	PCC	BCVA502C	Analysis of Statically Indeterminate Structures	Civil Engineering	3	0	0	50	50	100	**3**
3.	PCC	BCVA503C	Foundation Engineering	Civil Engineering	2	0	0	50	50	100	**2**
4.	PEC	BCV**X**504E	Professional Elective Course-I	Civil Engineering	3	0	0	50	50	100	**3**
5.	OEC	BCV**X**505N	Open Elective Course-I	Respective Department	3	0	0	50	50	100	**3**
6	PCC	BCVA506P	Mini project	Civil Engineering	0	0	4	50	50	100	**2**
7	PCC	BCVA507L	Geotechnical Engineering lab	Civil Engineering	0	0	2	50	50	100	**1**
8	HSMC		Environmental Studies	Biotechnology	1	0	0	50	50	100	**1**
9	AEC	**BHSAXXX**	Quantitative Aptitude and Professional Skills	Humanities	2	0	0	50	50	100	**2**
10	MC	**BHS001/002/003M**	NSS/Yoga/PE/Music	Humanities	-	-	-				**0**
					17	**0**	**4**	**450**	**450**	**900**	**20**

Professional Elective Course -I					Open Elective- 1				
Code	Title	L	T	P	Code	Title	L	T	P
BCV**A**504E	Alternative Building Materials and Technologies	3	0	0	BCV**A**505N	Groundwater Hydrology	3	0	0
BCV**B**504E	Water Resources Engineering	3	0	0	BCV**B**505N	Remote Sensing and GIS	3	0	0
BCV**C**504E	Air pollution and control	3	0	0	BCV**C**505N	Process Economics and Plant Design	3	0	0
BCV**D**504E	Highway Geometric Design	3	0	0	BCV**D**505N	Sustainable Development	3	0	0
BCV**E**504E	Advanced Surveying	3	0	0	BCV**E**505N	Air Pollution and Control	3	0	0
BCV**F**504E	Masonry Structures	3	0	0	BCV**F**505N	Green Building Technology	3	0	0

Basaveshwar Engineering College, Bagalkote

B.E–3rd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) (2026-27 Academic Year)

VI Semester **Branch: Civil Engineering**

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	PCC	BCVA601C	Design of RC Structures	Civil Engineering	3	0	0	50	50	100	**3**
2.	PCC	BCVA602C	Irrigation Engineering	Civil Engineering	2	0	0	50	50	100	**2**
3.	PCC	BCVA603C	Estimation and Costing	Civil Engineering	3	0	0	50	50	100	**3**
4.	PCC	BCVA604C	Advanced Wastewater Engineering	Civil Engineering	3	0	0	50	50	100	**3**
5.	PEC	BCV**X**605E	Professional Elective Course-II	Civil Engineering	3	0	0	50	50	100	**3**
6.	OEC	BCV**X**606N	Open Elective Course-II	Respective Department	3	0	0	50	50.	100	**3**
7.	PCC	BCVA607L	Software Application Lab	Civil Engineering	0	0	2	50	50	100	**1**
8.	PCC	BCVA608L	Environmental Engg lab	Civil Engineering	0	0	2	50	50	100	**1**
9	AEC	**BHSA**	Indian Knowledge System	Humanities	1	0	0	50	50	100	**1**
10	MC	BHS001/002/003M	NSS/Yoga/PE/Music	Humanities	-	-	-	-	-	-	**0**
					18	**0**	**6**	**450**	**450**	**900**	**20**

Professional Elective Course-II					Open Elective–II				
Code	Title	L	T	P	Code	Title	L	T	P
BCV**A**605E	Traffic Engineering	3	0	0	BCV**A**606N	Energy efficient buildings	3	0	0
BCV**B**605E	Matrix Methods of Structural Analysis	3	0	0	BCV**B**606N	Disaster Management and Mitigation	***3***	***0***	***0***
BCV**C**605E	Geomorphology	3	0	0	BCV**C**606N	Public Health Engineering	3	0	0
BCV**D**605E	Advance Concrete Technology	3	0	0	BCV**D**606N	Occupational Health and Safety	3	0	0
BCV**E**605E	Ground Improvement Techniques	3	0	0					

Basaveshwar Engineering College, Bagalkote

B.E–4th Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) (2027-28 Academic Year)

VII - Semester **Branch: Civil Engineering**

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	PCC	BCVA701C	Design of Steel Structures	Civil Engineering	3	0	0	50	50	100	**3**
2.	PCC	BCVA702C	Design of Pre-stressed Concrete Structures	Civil Engineering	3	0	0	50	50	100	**3**
3	HSMC	BCVA703C	Construction Management	Civil Engineering	3	0	0	50	50	100	**3**
4	PEC	**BCVX704E**	Professional Elective Course - III	Civil Engineering	3	0	0	50	50	100	**3**
5	PEC	**BCVX705E**	Professional Elective Course-IV	Civil Engineering	3	0	0	50	50	100	**3**
6	Project	BCVA706P	Project Work	Civil Engineering	-	-	18	50	50	100	**9**
7	MC	BHS001/002/ 003M	NSS/Yoga/PE/Music	Humanities	-	-	-	-	-	-	0
					15	**0**	**18**	**300**	**300**	**600**	**24**

Professional Elective Course –III					Professional Elective Course -IV				
Code	Title	L	T	P	Code	Title	L	T	P
BCV**A**704E	Advanced Design of RC Structures	3	0	0	BCV**A**705E	Design of Bridges	3	0	0
BCV**B**704E	Numerical Techniques in Civil Engg	3	0	0	BCV**B**705E	Deep Foundations	3	0	0
BCV**C**704E	Soil Dynamics and Earthquake Engineering	3	0	0	BCV**C**705E	Solid Waste Management	3	0	0
BCV**D**704E	Industrial Waste Water treatment	3	0	0	BCV**D**705E	Pavement Design	3	0	0
BCV**E**704E	Design of Hydraulics Structures	3	0	0	BCV**E**705E	Environmental Impact Assessment	3	0	0
BCV**F**704E	Railway and Airport Engg								

Basaveshwar Engineering College, Bagalkote

B.E–4th Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) (2027-28 Academic Year)

VIII –Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	INT	BCVA801I	Research / Industrial Internship	NP	-	-	-	50	50	100	10
2.	AEC	BCVA802O	MOOCs*	NP	3	0	0	50	50	100	3
3.	OEC	BCVA803O	MOOCs*	NP	3	0	0	50	50	100	3
4	MC	BHS001/002/003M	NSS/Yoga/PE/Music	Humanities	-	-	-	-	-	-	-
					6	**0**	**0**	**150**	**150**	**300**	**16**

BCVA302C	MECHANICS OF MATERIALS	Credits: 03
L:T:P – 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, state of simple shear, relationship among elastic constants.	
UNIT–II	**10 Hrs.**
Compound Stresses: Introduction, state of stress at a point, General two-dimensional stress system, Principal stresses and principal planes. **Bending moment and shear force diagrams in beams:** Introduction to shear force and bending moment, definitions and sign conventions, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load), Couple and their combinations	
UNIT–III	**10 Hrs.**
Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for rectangular, 'I', circular and 'T' sections.	
UNIT–IV	**10 Hrs.**
Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment- curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple. **Columns and Struts:** Introduction, short and long columns. 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.	

Reference Books

1. Punmia, B. C., Jain, A. K., & Jain, A. K. (2018), *Strength of Materials* (10th ed.), Laxmi Publications.
2. Bansal, R. K. (2010), *A Textbook of Strength of Materials* (4th ed., revised), Laxmi Publications.
3. Basavarajaiah, B. S., &Mahadevappa, P. (2010), *Strength of Materials in SI Units* (3rd ed.), University Press.
4. Rattan, S. S. (2017), *Strength of Materials* (3rd ed.), McGraw Hill Education (India) Pvt. Ltd.
5. Vazirani, V. N., Ratwani, M. M., & Duggal, S. K. (2009), *Analysis of Structures Vol. I* (17th ed.), Khanna Publishers.
6. Rajput, R. K. (2018), *Strength of Materials* (7th ed.), S. Chand Publishing.
7. Bhavikatti, S. S. (2021), *Strength of Materials* (5th ed.), Vikas Publishing House
8. Beer, F. P., Johnston, E. R., DeWolf, J. T., & Mazurek, D. F. (2020), *Mechanics of Materials* (8th ed.), McGraw-Hill Education.
9. Hibbeler, R. C. (2024), *Mechanics of Materials* (11th ed.), Pearson publications

Course Outcomes

After completion of the course students will be able to	
1	Evaluate the fundamental concepts of stress, strain, Hooke's law, and elastic constants to analyze deformation in bars and composite members.
2.	Determine principal stresses, locate principal planes and construct shear force and bending moment diagrams for beams.

3. Determine bending and shear stresses in beams of various cross-sections using flexural and shear formulas.
4. Evaluate the deflections in beams and determine the buckling load of the columns for different end Conditions.

Course Outcomes	**Programme Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	3	3	2	1	-	-	-	1	-	2	2	2	-
CO2	3	3	3	2	1	-	-	-	1	-	2	2	2	-
CO3	3	3	3	2	1	-	-	-	1	-	2	2	2	-
CO4	3	3	3	2	1	-	-	-	1	-	2	2	2	-
Average	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**2**	**-**

BCVA303C	SURVEYING	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.

Introduction: Definition of surveying, Objectives and importance of surveying. Classification of surveying, Principles of surveying, Units of measurements, Chain and tape types, Surveying measurements and errors.

Measurement of Directions and Angles: Compass survey: Basic definitions, meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearing system, whole circle bearing system, local attraction.

UNIT–II	10 Hrs.

Levelling: Basic terms and definitions, Methods of levelling-Spirit levelling , Types of levels-Dumpy level, auto level, digital and laser levels-Instrument setup, Booking and reduction of levels-HI method, Rise and fall method. Differential levelling, profile levelling, fly levelling, check levelling, reciprocal levelling, Numerical problems.

Contouring: Contours definition and characteristics, Methods of contouring, Interpolation of contours, contour gradient, and contours uses.

UNIT–III	10 Hrs.

Theodolite Survey: Theodolite and types, Fundamental axes and parts of Vernier Transit theodolite, uses of theodolite, Temporary adjustments, measurement of horizontal angles (Repetition and reiteration methods) and vertical angles

Trigonometric Levelling: Determination of Heights and Distances: of an accessible object, Inaccessible object by single plane and double plane methods, Numerical problems.

UNIT–IV	10 Hrs.

Areas and Volumes- Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by Prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps; Earthwork calculation in Embankments.

Curves: Simple curves: Types, Elements, Designation of curves, setting out of simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), and Setting out curves by Rankine's deflection angle method, Numerical problems.

Introduction to modern surveying Instruments: Total Station, segments in GPS, working principles & applications. Setting out works using Total Station, Setting out buildings by Centre line method.

Reference Books *

1. B.C. Punmia, Surveying, Vol. 1 , 16th Edition, Laxmi Publications, New Delhi.2005
2. S. S. Bhavikatti, 'Surveying & Leveling Vol-I', I. K. International New Delhi, 2008
3. S.K. Duggal, "Surveying Vol. I & II", Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi.
5. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers
6. B Bhatia, Remote Sensing and GIS, Oxford University Press, New Delhi.
7. T.M Lillesand, R.W Kiefer,. and J.W Chipman, Remote sensing and Image interpretation, 5th edition, John Wiley and Sons India
8. James M Anderson and Adward M Mikhail, Surveying theory and practice, 7th Edition, Tata McGraw Hill Publication

9. Kang-tsung Chang, Introduction to geographic information systems, McGraw Hill HigherEducation.

Course Outcomes**

After completion of the course student will be able to

1. Students will get the knowledge of basics of surveying and basic instruments used in civil engineering surveys and Application of compass surveying for measurement of areas, bearing and distance along with the direction.

2. Finding the elevation, elevation differences and heights of different objects under different conditions.

3. In finding the elevations of different targets with respect to instruments under different conditions and relative position of different targets with respect to given point.

4. Setting of curves by different methods for different alignments.

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**		**1**	**2**	**3**
CO1	3	3	2	1	2	-	-	-	-	-	1		2	3	1
CO2	3	3	2	1	2	-	-	-	-	-	1		2	3	1
CO3	3	3	2	1	2	-	-	-	-	-	1		2	3	1
CO4	3	3	1	1	2	-	-	-	-	-	1		2	3	1

BCVA304C	CONCRETE TECHNOLOGY	Credits: 03
L:T:P-3: 0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10 Hrs.

Cement and Aggregates:

Cement, Chemical Composition, Hydration of Cement. Types of cement, Manufacture of cement, Testing of cement - Field testing. Fineness by Sieve test and Blaine's air permeability test, Normal consistency test, Setting time test and Soundness test.

Fine aggregates- Grading of aggregates, Specific gravity, Bulking, Moisture content and Deleterious materials.

Coarse aggregates-Importanceofsize,shapeandtexture.Gradingofaggregates,Sieveanalysis, and Specific gravity. Flakiness and Elongation index, Crushing, Impact and Abrasion tests.

UNIT–II	10 Hrs.

Fresh Concrete Properties

Workability - Factors affecting workability, Measurement of workability –Slump Test, Flow test, CompactingFactorTestandVee-beeConsistometerTest.SegregationandBleeding.Manufacturing process of concrete-Batching, mixing, transporting, placing, compaction and curing.

UNIT–III	10 Hrs.

Admixtures - Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures- Fly ash, silica fume and rice husk ash. Water proofing compounds.

Hardened Concrete Properties: Testing of hardened concrete – Compressive strength, Split tensile strength and Flexural Strength test. Factors affecting strength. w/c ratio, aggregate properties. Relation between Compressive strength and Tensile strength, Bond strength, Modulus of rupture and Elasticity.

UNIT–IV	10 Hrs.

Durability - Definition, Factors affecting, environmental exposure conditions, Permeability – Definition, factors affecting permeability. Shrinkage, factors affecting shrinkage; Creep - factors affecting creep, effect of creep.

Concrete Mix Design

Concept of mix design, variables in proportioning, exposure conditions. Procedure of mix design as per IS 10262:2019. Numerical examples of mix design on mix design for OPC concrete mixes and Fly ash concrete mixes.

Reference Books *

1. M. S. Shetty Concrete Technology Theory and Practice, S. Chand and Co, New Delhi,2002.
2. Neivelle A. M and Brooks, Concrete Technology, J.JELBS Edition, London Delhi, 4th Edition, 2004.
3. P. Kumar Mehta & Paul J.M, Concrete Technology, Monterio Indian Concrete Institute USA- 1999
4. IS 10262:2019 for concrete mix design.
5. A. R. SanthaKumar, “Concrete Technology”, Oxford University Press, New Delhi(New Edition).
6. M. L. Gambhir, “Concrete Technology”,Mc Graw Hill Education, 2014.
7. N. V. Nayak, A. K. Jain Hand book on advanced Concrete Technology, ISBN:978-818487-186-9

Course Outcomes**

After completion of the course student will be able to

CO1: **Explain** the manufacturing process, types, chemical composition, and hydration of cement; **analyze** the properties and grading of aggregates; and **perform** relevant standard tests on cement and aggregates.

CO2: **Describe** the properties of fresh concrete including workability, segregation, and bleeding; **demonstrate** various methods for measuring workability; and **illustrate** the concrete manufacturing process.

CO3: **Classify** different chemical and mineral admixtures used in concrete; **evaluate** the testing procedures for hardened concrete to determine its mechanical properties.

CO4: **Define** and **discuss** the factors affecting the durability of concrete; **apply** the IS 10262:2019 guidelines to **design** concrete mixes and **solve** numerical problems related to mix design.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	3	2		1					2	2	
CO2	2	2	2	2	3		1		1			2	2	
CO3	2	3	2	3	2	1	2		1	1	1	2	2	
CO4	3	3	3	3	2	1	2		1	1	2	2	2	

BCVA305C	BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10 Hrs.
Building materials: Bricks: Classification of bricks, Tests on bricks. **Other Building Materials**: Reinforcing steel, Structural steel. **Foundations:** Safe bearing capacity of soil, Plate load test, Classification of foundations, introduction to spread, combined, strap, mat and pile foundation.	
UNIT–II	**10 Hrs.**
Masonry: Definition of terms used in masonry, Types of bonds in brickwork, Coursed and Uncoursed rubble masonry, Ashlar masonry. **Stairs, doors, windows, and ventilators:** Technical terms in stairs, Requirements of a good stair, Geometric design of RCC dog legged and open well stairs (plan and sectional elevation of stairs), **Doors:** Different types of doors, Windows, and Ventilators.	
UNIT–III	**10 Hrs.**
Floors: Types of flooring (Materials and methods of laying): Granolithic, Ceramic, Marble, Polished Granite flooring **Roofs:** Flat Roof (R.C. Flat terraced roofing), Lean to roof, Wooden truss (King post and Queen post truss).	
UNIT–IV	**10 Hrs.**
Arch, Lintel, Chejja: Classification of arches and Lintels: Types and classifications, Chejja, Functions. **Plastering and painting:** Purpose of plastering, Materials used for plastering, Lime mortar, Cement Mortar, Methods of plastering, Purpose of Painting, Application of paints to new and old surfaces, Distemper, Plastic emulsion, Enamel Powder coated painting to walls and steel surfaces, Polishing of wood surface.	

Reference Books

1. Punmia, B. C., Jain, A. K., & Jain, A. K. (2023), *Building Construction* (12th ed.), Laxmi Publications Pvt. Ltd.
2. Rangwala, S. C. (2022), *Building Construction* (34th ed.), Charotar Publishing House Pvt. Ltd.
3. Kumar, S. (2023), *Building Construction* (20th ed. Reprint), Standard Publishers & Distributors.
4. Rangwala, P. C. (c. 2020), *Engineering Materials* (43rd ed.), Charotar Publishing House Pvt. Ltd.
5. Sushil Kumar, Engineering Materials, Standard Publication and Distributors, New Delhi

Course Outcomes

After completion of the course students will be able to

1. Identify and classify common building materials such as bricks and steels and explain testing methods and foundation types based on soil bearing capacity.
2. Describe masonry terms, differentiate between types of bonds and masonry, and interpret design elements of stairs, doors, windows, and ventilators.
3. Explain flooring types and laying methods, identify roof types and trusses, and classify arches, lintels, and chejjas with their functions.
4. Select appropriate plastering and painting materials and demonstrate application techniques for various surfaces in buildings.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	2	2	2	-	-	2	-	-	-	2	1	1	-	-
CO2	2	2	2	-	-	2	-	-	-	2	1	1	-	-
CO3	2	2	2	-	-	2	-	-	-	2	1	1	-	-
CO4	2	2	2	-	-	2	-	-	-	2	1	1	-	-
Average	**2**	**2**	**2**	-	-	**2**	-	-	-	**2**	**1**	**1**	-	-

BCVA306C	ENGINEERING GEOLOGY	Credits: 03
L-T-P : 3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Introduction: Geology- its branches; Engineering geology, its importance in civil engineering; Work activities of engineering geologist. Internal structure and composition of earth.

Mineralogy: Definition, importance and general classification of minerals; Study of physical properties, chemical composition and uses of common rock forming and ore forming minerals; Stability of the minerals

UNIT–II	10 Hrs.

Petrology: Introduction, definitions and general classification of rocks; Rock cycle; Mode of occurrence, structures, textures, classification, descriptions and engineering usage of important igneous, sedimentary and metamorphic rocks

Geomorphology and Geo-dynamics: Epigene and hypogene geological agents; Weathering of rocks, types of weathering; Significance of Weathering in Civil Engineering. Soil – its formation, profile, classification, erosion and conservation. Earthquakes - Causes and effects, plate tectonics and elastic rebound theory; Seismic resistant structures. Stability of slopes- Landslides: Causes, effects and preventive measures.

UNIT–III	10 Hrs.

Structural Geology: Basic definitions - outcrop, inlier, outlier, dip and strike; Use of Clinometer compass and Brunton compass. Study of important Geological structures - Faults, Folds, Joints and Unconformities - definition, classification, recognition in the field and significance in civil engineering. Selection of sites for civil engineering projects - dams, reservoirs and tunnels.

UNIT–IV	10 Hrs.

Hydrogeology: Hydrological cycle, mode of occurrence and sources of groundwater; Water bearing properties of rocks and soils; Aquifers and their types. Influence of groundwater in engineering construction; groundwater exploration by geophysical method; Artificial recharge of groundwater.

Environmental Geology: Definition and fundamental concepts of environmental geology; Interaction between human, geology and environment; Global warming and greenhouse effect; Environmental impacts of mining; Concept of eco friendly mining.

Text Books

1. Parbin Singh-A **Text book of Engineering & General Geology**; S.K. Kataria & Sons, 8th Revised Edn. New Delhi.2008
2. Santoshkumar Garg – **Physical and Engineering Geology;** Khanna Publishers, 3rdrevised and enlarged Edn New Delhi. 1999.
3. P.K Mukerjee-A **Textbook of Geology;** The World Press,11th reviser Edn Pvt Ltd Calcutta.1990.
4. K.M.Bangar- **Principals of Engineering Geology;** Standard Publishers and Distributors, New Delhi.2004

5. D. Venkat Reddy-**Engineering Geology for Civil Engineers;** Oxford & IBH Publishers, New Delhi.1997.
6. N.Chennakesavalu - Text Book of Engineering Geology; Macmillan Publishers2nd Edn India Ltd. New Delhi. 2009.
7. Vasudev Kanithi – Engineering Geology; Universities Press (India) Pvt. Ltd. Hyderabad. 2018.
8. Subinoy Gangopadhyay- Engineering Geology; Oxford Universities Press New Delhi. 2013.
9. F.G.H.Blyth, M.H.de Freitas –Geology for Engineers; Elsevier publications 7th Edn 1988.
10. KVGK Gokhale-Principles of Engineering Geology; B S Publications, Hyderabad.

REFERENCES BOOKS

1. N.W. Gokhale **- Theory of Structural Geology;** CBS Publishers & Distributors, New Delhi2nd Edn. 2003.
2. H.H.Read**- Rutley's, Elements of Mineralogy;** CBS Publishers & Distributors, New Delhi 26th Edn 1984.
3. G.W.Tyrrel- **Principles of Petrology;** BI Publications Pvt Ltd, New Delhi 1st Edn 1987.
4. S.K.Duggal, H.K.Pandey, N.Rawal – Engineering Geology, Mc Graw Hill Education publications 2017
5. K.S.Valdiya– Geology, Environment and Society; University Press (India) Pvt.Ltd., Hyderabad

Course Outcomes

After completion of the course student will be able to

. **CO1 :** Explain the fundamental concepts of geology, Earth's structure, and the properties of common rock-forming and ore-forming minerals relevant to civil engineering.

C**O2 :** Analyze different types of rocks, soils, and geological processes (weathering, earthquakes, landslides) in relation to civil engineering structures.

CO3 : Evaluate geological structures such as folds, faults, joints, and unconformities for their significance in selecting sites for dams, reservoirs, and tunnels.

CO4 : Assess groundwater conditions and environmental geology issues to recommend sustainable solutions for engineering construction and mining.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	2		2	2						1	
CO2	3	3	3	2		2	3						1	
CO3	2	3	2			2	3						1	
CO4	2	2	2	2	3		2						1	

BCV307L	ENGINEERING GEOLOGY LAB	Credits: 01
L-T-P : 0-0-2		CIEMarks:50
Total Hours/Week: 02		SEEMarks:50

LIST OF EXPERIMENTS

1. Megascopic Identification of Minerals based on their Physical properties; Quartz and its varieties.
2. Megascopic Identification of Minerals based on their Physical properties ; Felspars,Micas, Hornblende, Olivine, Serpentine, Asbestos, Kyanite, Talc, Garnet, Corundumand Barite.
3. Megascopic Identification of Minerals based on their Physical properties ; Carbonates and Ore minerals.
4. Megascopic Identification of Igneous Rocks based on Geological properties : Granite, Syenite, Diorite, Gabbro, Dunite, Porphyries, Dolerite, Pegmatite, Basalt and Pumice.
5. Megascopic Identification of Sedimentary Rrocks based on Geological properties:Sandstone, Limestone, Shale, Breccia, Conglomerate and Laterite.
6. Megascopic Identification of Metamorphic Rocks based on Geological Properties : Gneiss, Quartzite, Marble, Slate, Phyllite, Schist and Charnockite.
7. Study and interpretation of standard geological maps.
8. Dip and Strike problems.
9. Bore hole Problems(On Level Ground).
10. Thickness Problems.

REFERENCE BOOKS

1. B.S. Satyanarayanswamy- Engineering Geology lab Manual, Eurasia Publication, New Delhi. 2003.
2. M.T.Maruthesha Reddy- Engineering Geology Practicals, New Age International Pvt Ltd , 1st Edn, New Delhi 2002.
3. N.W.Gokhale-Manual of Geological Maps, CBS Publishers & Distributors, 1st Edn, New Delhi.1987.
4. N.W.Gokhale-ExercisesongeologicalMaps&Dip-StrikeProblems,CBSPublishers &Distributors, 1st Edn, New Delhi.1996.
5. N.W.Gokhale-AGuidetoFieldGeology,CBSPublishers&Distributors,1stEdn.New Delhi.2001

Course Outcomes

After completion of the course student will be able to

CO1: *Identify* common rock-forming and ore-forming minerals using their physical properties through megascopic examination.

CO2: *Classify* igneous, sedimentary, and metamorphic rocks based on their geological characteristics and field appearances.

CO3: *Interpret* geological maps and *solve* dip and strike problems, borehole data, and thickness problems relevant to subsurface geology.

CO4: *Apply* geological knowledge to analyze and *evaluate* subsurface conditions for civil engineering projects using practical data

Course Outcomes	Programme Outcomes(POs)											Program Specific Outcomes(PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	3	2	2		2	2						1	
CO2	3	3	3	2		2	3						1	
CO3	2	3	2			2	3						1	
CO4	2	2	2	2	3		2						1	

BCVA308L	Building Planning and Drawing using CAD	Credits:01
L:T:P-0:0:2		CIE Marks:50
Total Hours/Week:2		SEE Marks:50

List of Experiments

1. Indian Standard- Specifications of Drawings, Introduction to Auto CAD
2. Cross section of stepped wall Foundation, masonry wall.
3. Cross section of masonry wall for one story building.
4. Cross section of masonry wall for two storied building
5. Plan and cross section of staircases – Dog legged.
6. Plan and cross section of staircases – Open well
7. Single Storied Building with one bed room
8. Single Storied Building with two bed room
9. Planning of Primary health center – Single Line Diagram
10. Planning of Primary school building. – Single Line Diagram
11. Planning of PWD division office. – Single Line Diagram
12. Planning of Tahshildar Office. – Single Line Diagram

Reference Books*

1. Shah M.H and Kale C.M., Building Drawing, Tata McGraw Hill Publishing co Ltd., New Delhi,4th Edi,2008.
2. Gurucharan Singh, Building Construction, Standard Publishers &distributors, New Delhi, 4thEdn. 1989.
3. Sushil Kumar, Building Construction, Standard Publications, New Delhi, 19th Edn. May 2018.

National Building Code, BIS, New Delhi, Dec 1986.

Course Outcomes

Student will be able

1. To understand the basic concept on Cad software tools.
2. To prepare working drawing for various components of a building and
3. To prepare, read and interpret the detailed drawing for residential building in a professional set up.
4. To prepare the single line diagram for various public buildings.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11		1	2	3
CO1	1	2	-	2	-	1	-	-	-	1	-		-	-	-
CO2	-	2	-	2	-	3	-	-	-	-	-		-	-	-
CO3	-	-	3	-	-	-	3	-	-	-	-		-	-	-
CO4	-	-	3	3	3	-	-	3	-	-	-		-	-	-

LABORATORY ASSESSMENT:

1. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).
2. Allocation of 50 marks for CIE
   - Performance and journal write - up:
   - Marks for each experiment = 30 marks/ No. of proposed experiments.
   - One Practical test for 20 Marks. (5write-ups, 10 conduction, calculation, results etc. 5viva-voce)
3. Allocation of 50 marks for SEE.
   - 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.

BCVA309L	BASIC MATERIALS AND CONCRETE TESTING LABORATORY	Credits 1:0:0
Hrs/Week : 02		CIE Marks:50
Total Hours:		SEE Marks:50

BASIC MATERIALS

1. Tension test on HYSD bars
2. Torsion test on mild steel circular sections.
3. Bending test on wood under two-point loading
4. Test on bricks - Compressive strength and Absorption
5. Compression test on wood
6. Tests on Fine aggregates - Sieve Analysis, Moisture content, Specific gravity, Bulk density, Bulking and Silt Content
7. Tests on Coarse aggregates - Sieve Analysis, Water absorption, Moisture content, specific gravity and Bulk density.

CEMENT & CONCRETE

1. Tests on cement : Normal consistency, setting time, soundness by Autoclave method, fineness, specific gravity
2. Tests on Fresh concrete : Workability, slump, compaction factor, flow test and Vee-Bee test
3. Tests on Hardened concrete : Compression strength, Split tensile strength and flexural strength

TEXT BOOKS

1. Davis, Troxell and Hawk, Testing of Engineering Materials, International Student Edition McGraw Hill Book Co. New Delhi.1982
2. Fenner, Mechanical Testing of Materials, George Newnes Ltd. London.1965
3. Holes K A, English, Experimental Strength of Materials, Universities Press Ltd.London.2010
4. Suryanarayana A K, Testing of Metallic Materials, Prentice Hall of India Pvt. Ltd. New Delhi.2007
5. Kukreja C B, Kishore K. Ravi Chawla, Material Testing Laboratory Manual, Standard Publishers & Distributors 1996.
6. M.L.Gambhir, Concrete Manual, Dhanpat Rai & Sons- New Delhi.2004

Laboratory Assessment

1. Each Laboratory Subject is evaluated for 100 marks (50 CIE and 50 SEE) Allocation of 50 marks for CIE Performance and Journal write-up: Marks for each experiment = 30 marks / No. of proposed experiments. One Practical test for 20 marks (5 write-up, 10 conduction, calculation, results etc., 5 viva-voice).
2. Allocation of 50 marks for SEE 25% write-up, 50% conduction, calculation, results etc 25 % viva-voice.

Course Outcomes: After completion of the course students will be able to

1. To conduct and analyze mechanical tests on construction materials.
2. Evaluate the physical properties of fine and coarse aggregates
3. Determine the physical properties of cement
4. Assess the workability and strength characteristics of concrete

CO-PO MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	--	--	--	3	3	3	3	3	3	--	--	3	--
2	3	--	--	--	3	3	3	3	3	3	--	--	3	--
3	3	--	--	--	3	3	3	3	3	3	--	--	3	--
4	3	--	--	--	3	3	3	3	3	3	--	--	3	--
Avg	**3**	--	--	--	**3**	**3**	**3**	**3**	**3**	**3**	--	--	**3**	**--**

BCVA402C	Analysis of Statically Determinate Structures	Credits:03
L: T:P-3:0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10Hrs

Introductory Concepts: Structural systems, Forms of structures. One-, two- and three-dimensional structures. Compatibility and Constitutive relations. Material and Geometric linearity and nonlinearity. Determinate and indeterminate structures- Degree of Indeterminacy (Static and Kinematic). Deflection of beams by Moment-Area & Conjugate beam methods: Moment area theorems and conjugate beam theorems. Analysis of statically determinate beams. Numerical problems

UNIT–II	10Hrs.

Deflection of beams and trusses by strain Energy methods: Strain Energy and Complementary strain energy, Strain energy due to axial load, bending. Principle of virtual work; Castigliano's theorems-I. Numerical problems on deflections of statically determinate beams using Castigliano's theorem-I and unit load methods. Deflection of trusses.

UNIT–III	10Hrs.

Analysis of Arches: Three hinged parabolic arches with supports at same and different levels determination of thrust, shear and bending moment. Analysis of Cables: Analysis of cables under point load and udl, length of cables, supports at same and different levels

UNIT–IV	10Hrs.

Rolling Loads and Influence Lines: Rolling Loads, Influence line diagram for reaction, shear force and bending moment at a section for simply supported beams due to point loads and uniformly distributed loads. Uses of Influence lines for analysis of simply supported beam for single and several point loads, uniformly distributed loads

Reference Books*

Reference Books *

1. B C Punmia, Ashok Kumar Jain, Aran Kumar Jain Theory of structures Vol-I & II Laxmi Publications, New Delhi-2004
2. C S Reddy-Basic Structural Analysis, 2 Edition, Tata Mc Graw Hill, New Delhi-2003.
3. Ramamrutham, R Narayan-Theory of structures,Dhanpt Rai Publishing Company,8 Edition New Delhi-2008

Course Outcomes

1. Compute degree of static and kinematic indeterminacy of structures and determine slopes and deflections for statically determinate beams.
2. Analyze statically determinate beams and trusses for deflections.
3. Analyze three hinged parabolic arches and cables for internal forces.
4. Draw influence lines and determine SF and BM due to rolling loads on simply supported beams

Course Articulation Matrix (CAM)

Sl. No.	Course Outcomes (CO's)	Program outcomes (PO's)											PSOs		
		1	2	3	4	5	6	7	8	9	10	11	1	2	3
01	CO1	3	2	1	1	1	-	-	-	-	-	-	2	2	2
02	CO2	3	3	1	2	2	-	-	-	-	-	-	2	2	2
03	CO3	3	3	2	2	2	-	-	-	-	-	-	2	2	2
04	CO4	3	2	2	2	2	-	-	-	-	-	-	2	2	2

BCVA403C	Soil Mechanics	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10 Hrs.

Introduction: Formation of soil, phase diagram, basic definitions and their interrelationships.

Index Properties-Definitions and their determination, particle size analysis (sieve and Hydrometer analysis) consistency limits and indices, plasticity chart, activity of clay, field identification tests, BIS soil classification (IS: 1498-1970).

Clay Mineralogy: Soil structure- single grained, honeycombed, flocculent and dispersed structures, soil-water system, electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures-Kaolinite, Illite and Montmorillonite and their application in engineering.

UNIT-II	10 Hrs.

Flow Through Soils: Darcy's law-assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, seepage velocity, superficial velocity and coefficient of percolation, capillary phenomena.

Seepage Analysis: Laplace equation, assumptions, limitations and its derivation. flow nets-characteristicsandapplications.Flownetsforsheetpilesandbelowthedamsection.Unconfined flow, phreaticline (Casagrande's method–with and without toefilter), flow through dams, design of dam filters.

UNIT–III	10 Hrs.

Compaction of Soil: Definition, principle of compaction, standard and modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, field compaction control- compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, compacting equipments and their suitability.

Consolidation of Soil: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_C, a_V, $m_V$and C_V), Time rate of consolidation.

UNIT–IV	10 Hrs.

Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, conventional and modified failure envelops, total and effective shear strength parameters, concept of pore pressure, factors affecting shear strength of soils, sensitivity and thixotropy of clay.

Measurement of shear parameters- direct shear test, unconfined compression test, triaxial compression test and vane shear test, Test under different drainage conditions.

Reference Books *

1. G. Ranjan and A.S.R Rao (2022), Basic and Applied Soil Mechanics (4th Edition), New Age International (P) Ltd., New Delhi.
2. B. M. Das (2021), Principles of Geotechnical Engineering (10th Edition), Cengage India Pvt. Ltd.
3. J. Knappett and R. F. Craig (2019), Craig's Soil Mechanics (9th Edition), CRC Press.
4. B. C. Punmia, A. K. Jain and A. K. Jain (2017), Soil Mechanics and Foundation Engineering (17th Edition), Laxmi Publications Co, New Delhi.

Course Outcomes**
After completion of the course student will be able to 1. Analyse and interpret soil properties and clay mineralogy to effectively apply engineering principles in practical scenarios. 2. Apply Darcy's law, seepage phenomena, and utilize flow nets to solve practical engineering problems related to flow through soils and seepage analysis. 3. Apply the principles of compaction and consolidation to effectively control soil behaviour in engineering projects. 4. Determine settlement of soils and utilize testing methods to find shear strength parameters.

Course Outcomes	**Programme Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	1						1					3	
CO2	2	1											3	**1**
CO3	3	2		1				1					3	
CO4	2	2		1				1					3	
	2.5	1.5		1.0				1.0					3	**1**

BCVA404C	Highway Engineering	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10Hrs.

Principles of Transportation Engineering: Importance of transportation, Different modes of transportation. Characteristics of road transport, Importance of Roads in India, Current Road development Programs in India.

Highway Development and Planning: Highway Development in India, Highway Planning, Planning Surveys and Interpretation.

HighwayAlignment and Project preparation: Highway Alignment, Engineering Surveys for Highway Alignment, Drawings and Reports, Highway Projects, Preparation of Detailed Project Report

UNIT–II	10 Hrs.

Highway Geometric Design of horizontal alignment elements: Cross sectional elements, Sight distance, Design of Horizontal alignment, Design of vertical alignment.

Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples.

UNIT–III	10 Hrs.

Pavement Materials: Sub grade soil -desirable properties-HRB soil classificationdetermination of CBR and modulus of sub grade reaction with Problems. Aggregates- Desirable properties. Bituminous Binders & Mixes- Types, desirable properties. Pavement Quality concrete- Materials, Requirements.

Pavement Construction: General features, Embankment and Subgrade, Construction of Flexible pavements, Construction of CC pavements.

UNIT–IV	10 Hrs.

Highway Drainage: Significance and requirements, Surface drainage system, sub surface drainage system, Types of cross drainage structures, their choice and location.

Highway Economics: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual Cost method Benefit Cost Ratio method methods- Examples, Highway financing-BOT-BOOT concepts.

Reference Books *

1. Right, Paul H. and Dixon, Karen K., “Highway Engineering”, John Wiley and Sons Inc. 2004
2. Khanna, S.K. Justo, C.E.G. and Veeraragavan , A . “Highway Engineering”, Nem Chand & Bros. 2015
3. Papacostas, C.S. and Prevedouros, P.D., “Transportation Engineering and Planning”, Prentice Hall. 2002
4. JotinKhisty, C. and Kent Lall, B., “Transportation Engineering – An Introduction”, Third edition, Pearson India 2016
5. K. Subramaniam, “Transportation Engineering”, SciTech Publications, Chennai.
6. SaxenaSubhash C and Satyapal Arora, “A Course in Railway Engineering”, Dhanpat Rai and Sons, Delhi.
7. Chandra S. and Agarwal M.M. “Railway Engineering”, Oxford University Press India.
8. Khanna S K, Arora M G and Jain S S, “Airport Planning and Design”, Nem Chand and Bros.
9. Relevant Indian Roads Congress Codes – Geometric Aspects: IRC:38, 69, 73, 86, SP-23. Pavements: IRC:37, 58, 15, 44 Others: IRC:SP-42, SP-88, MORT&H Specifications
10. Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.
11. C. JotinKhisty, B. Kentlal, “Transportation Engineering”, PHI Learning Pvt. Ltd. New Delhi.

Course Outcomes**

After completion of the course student will be able to

1 .Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.

2. Design road geometrics, structural components of pavement

3. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.

4. Evaluate the highway drainage conditions and highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1		1				1		1				1		
CO2										1			1	
CO3	1		1			1					1			1
CO4										1			1	

BCVA405C	Fluid Mechanics and Hydraulics	Credits:04
L:T:P-4: 0: 0		CIEMarks:50
Total Hours/Week:4		SEEMarks:50

UNIT-I	13Hrs.

Properties of fluids: Density, Specific volume, specific weight, Relative density, and viscosity. Surface tension and Capillarity, Newton's law of viscosity, Types of fluids: Newtonian & Non-Newtonian fluids, Ideal and Real fluids. Numerical some properties, Newton's law of viscosity.

Fluid pressure and it's measurement: Derivation of Pascal's law, and Hydrostatic law. Numericals. Types of pressure. Manometers and their classification, theory, derivation and numericals, Mechanical pressure gauges and Bourdon's pressure gauge.

UNIT–II	13Hrs.

Fluid statics: Definition of Total pressure ,Centre of pressure ,Derivation of total hydrostatic force and depth of centre of pressure on a plane surface (Inclined) and numerical.

Fluid kinematics: Lagrangian and Eulenian approaches of fluid flow analysis, Classification of flows. Continuity equation, Derivation of Continuity equation in three dimensions , Numericals .

UNIT–III	13Hrs.

Pipe flow: Definition, Classification of flows, HGL and TEL, major and minor losses in pipe flows. Derivation of equation for head loss due to friction (Darcy-Weisbach equation).Flow through compound pipes, (Series Parallel, Equivalent size).Problems on major and minor head losses Derivation for pressure rise due to gradual and sudden closure of valve and numerical.

UNIT–IV	11Hrs.

Open channel flow: Definition and classification, Derivation of Chezy's and Manning's equations and Numerical. Most economical rectangular, trapezoidal and circular channel sections: Derivations and numerical.

Specific energy: Specific energy curve, Derivation of critical depth, critical velocity and minimum specific energy, Numerical. Froude's number and its significance. Hydraulic jump: derivation and numericals.

Reference Books *

1. JamesFCruise,VijayP.Singh,ElementaryHydraulics(1stEdition),MohsanM.Sherif,Thomson Learning. April 2006.
2. K.R.Arora Fluid Mechanics, Hydraulic and Hydraulics,StandardBookHouse,NewDelhi-2007.
3. JohnF.Douglas Fluid Mechanics.Pearson EducationNewDelhi,2011.
4. V.L.Streeter &B.Wylie Fluid Mechanics Lakshmi Publications,New Delhi,2007.
5. H.M.Raghunath Fluid MechanicsCBS PublicationNewDelhi.2008.
6. M.Manohar, FluidMechanics .Vol-IVikasPublishinghouse PvtLtdNew Delhi, 2008.

Course Outcomes

After completion of the course student will be able to:

1. Students should be able to use fluid properties basics to solve fluid Mechanics problems and compute hydrostatic pressure using various devices available
2. Students should be able apply concepts of hydrostatics and kinematics to real life fluid mechanics problems.
3. Should be able to apply Bernoulli's principle in fluid mechanics problems and Compute pressure heads and losses in different types of pipe connections.
4. Students will be able to design open channel sections and compute energy losses in hydraulic jumps.

Course Outcomes	Programme Outcomes											Programme specific Objectives		
	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1	1	-	-	-	-	-	2	2	2
CO 2	3	3	2	1	2	2	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	2	3	-	-	-	-	-	2	2	2
CO 4	3	2	2	2	2	2	-	-	-	-	-	2	2	2

BCVA406L	SURVEYING PRACTICE LAB	Credits:01
L:T:P-0:0:2		CIE Marks:50
Total Hours/Week:2		SEE Marks:50

List of Experiments

1. Demonstration of basic surveying instruments like (Chain, Tape etc…)
2. **Compass**
   - Setting out hexagon by compass
3. **Levelling**
   - Differential Levelling
   - Fly levelling and Fly back leveling
   - Reciprocal leveling, Profile and cross section levelling
   - Block Contouring
4. **Theodolite**
   - Measurement of Horizontal and vertical angles
   - Determination of elevation of an object: Base accessible
   - Determination of distance and elevation of an object: Base In-accessible- Single Plane
5. **Total Station**
   - Introduction → Taking Out Basic Measurements (SHV, REM, MLM)
   - Total Station –Station orientation, back sighting, Instrument Synchronization & Data recording.
   - Works on Total Station
   - Area Measurement
   - Topographic survey
   - Set out Parallel Lines
   - Downloading an contour map compilation only

Reference Books*

1. B.C. Punmia, Surveying, Vol. 1 Laxmi Publications, New Delhi.2005
2. A.M. Chandra, Plane Surveying, Vol-1, Newage International ® Ltd. 2nd Edn 2006
3. K. R. Arora, Plane Surveying, S. Chand and Company Ltd., New Delhi. Laboratory 1998
4. Dr.K.R.Arora, Plane and Advanced Surveying, Standerd Book House, New Delhi, 7th Edition-2009
5. GIS and Remote Sensing by Angireddi- 3rd Edition, Indian Publications, Hyderabad-2014.

Course Outcomes

CO1: Demonstrate the use of basic surveying instruments (chain, tape, compass, and level) for linear and angular measurements, and setting out of simple geometrical figures such as a hexagon.
CO2: Conduct various levelling techniques including differential, fly, reciprocal, and profile levelling, and interpret the results to generate elevation profiles and contour maps.
CO3: Utilize theodolite for measuring horizontal and vertical angles and determine elevations and distances for both accessible and inaccessible locations.
CO4: Operate a Total Station for data collection, area measurement, topographic survey, and layout of parallel lines; perform data transfer and compilation of contour maps using software tools.

Sl. No.	Course Outcomes(CO's)	Programme Objectives											PSOs		
		1	2	3	4	5	6	7	8	9	10	11	1	2	3
01	CO1	3	2	-	2	1	-	-	-	2	2	1	-	-	-
02	CO2	3	3	-	3	2	-	-	-	2	2	1	-	-	-
03	CO3	3	3	-	3	3	-	-	-	2	2	2	-	-	-
04	CO4	3	3	2	3	3	-	-	-	3	3	2	-	-	-

LABORATORY ASSESSMENT:

1. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).

2. Allocation of 50 marks for CIE

• Performance and journal write - up:

• Marks for each experiment = 30 marks/ No. of proposed experiments.

• One Practical test for 20 Marks. (5write-ups, 10 conduction, calculation, results etc. 5viva-voce)

3. Allocation of 50 marks for SEE.

• 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.

BCVA407L	Highway Materials Testing Lab	Credits: 01
L:T:P - 0 : 0: 2		CIEMarks:50
Total Hours/Week: 2		SEEMarks:50

PRACTICAL COMPONENT

Tests on Aggregates

a. Crushing Strength Test b. Los Angeles abrasion test c. Impact test

d. Shape tests (combined index and angularity number)

Tests on Bituminous Materials

a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test e. Viscosity test by tar viscometer f. Flash and fire point test

Tests on Soil

a. Wet sieve analysis b. CBR Test on soil

Design of flexible pavement as per IRC 37-2018

Design of Rigid pavement as per IRC 58-2015

Bituminous Mix Design by Marshall Method (Demonstration only)

Traffic Engineering studies.

Reference Books *

1. Khanna, S.K. Justo, C.E.G. and Veeraragavan , A . "Highway Engineering lab Manual", Nem Chand & Bros. 2015
2. Relevant Indian Roads Congress Codes – Geometric Aspects: IRC:38, 69, 73, 86, SP-23. Pavements: IRC:37, 58, 15, 44 Others: IRC:SP-42, SP-88, MORT&H Specifications
3. Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.
4. C. JotinKhisty, B. Kentlal, "Transportation Engineering", PHI Learning Pvt. Ltd. New Delhi.

Course Outcomes**

After completion of the laboratory student will be able to

1 . Acquires capability of choosing the appropriate aggregates for construction and design the pavement as per standard practices.

2. Acquires capability of choosing the appropriate bitumen for construction and design the pavement as per standard practices.

3. Select the appropriate soil for construction and design the pavement as per standard practices.

4. Able to interpret the experimental results of highway materials based on laboratory tests and design the pavement as per IRC guidelines.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1		1				1		1				1		
CO2										1			1	
CO3	1		1			1					1			1
CO4										1			1	

BCVA408L	**Fluid Mechanics Lab**	Credits :01
Hours/Week (L:T:P): 0:0:2		CIE Marks :50
Course Type: Practical		SEE Marks :50

Course Learning objectives: This course will enable students to

1. Learn the Principles of Kinematics, hydrodynamics and its applications
2. Study the Flow measurements
3. Understand the design of open channels and energy concepts
4. Understand the Working principles of hydraulic turbines and pumps

List of Experiments		
1	Calibration of Venture meter	L1,L2
2	Calibration of Orifice meter	L1,L2
3	Determination of hydraulic coefficients of small vertical orifice mouthpiece	L1,L2
4	Calibration of Rectangular notch	L1,L2
5	Calibration of triangular notch	L1,L2
6	Calibration of Trapezoidal notch	L1,L2
7	Determination of major losses in pipes	L1,L2
8	Determination of minor losses in pipes	L1,L2
9	Determination of Cd for ogee crested weir	L1,L2
10	Determination of Cd for broad crested weir	L1,L2
11	Determination of efficiency of jet on flat and curved vanes	L1,L2
12	Demo of determination of efficiency of centrifugal pump	L1,L2
13	Demo of determination of efficiency of Francis/Kaplan turbine	L1,L2
14	Demo of determination of efficiency of Pelton wheel	L1,L2

Suggested Learning resources

Text Books:

1. P.N. Modi and S.M. Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House, New Delhi
2. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGraw-Hill, New Delhi
3. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi
4. Victor L. Streeter, Benjamin Wyile E and Keith W. Bedford- Fluid Mechanics, Tata McGraw Hill publishing Co Ltd, New Delhi

Course Outcomes:

1. Calibrate discharge measuring apparatus when fluid flows through it.
2. Determine the major and minor in the pipes
3. Determine the impact of water jet flat and hemispherical vanes.
4. Calculate the Hydraulic Coefficients

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	3	3			1			2			3	2	
CO2	3	3	3			1			2			3	2	
CO3	3	3	3			1			2			3	1	
CO4	3	3	3			1			2			3	2	