

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

DIPLOMA PROGRAMME IN CIVIL ENGINEERING

Semester – IV

S.No	Board of Study	Course Code	Course	Periods/Week (in Hours)			Scheme of Examination					Credit L+(T+ P)/2	
				L	T	P	Theory			Practical			Total Marks
							ESE	CT	TA	ESE	TA		
1.	Civil Engg.	220411 (20)	Surveying-II	4	-	-	100	20	30	-	-	150	4
2.	Civil Engg.	220412 (20)	Public Health Engg.	4	1	-	100	20	30	-	-	150	5
3.	Civil Engg.	220413 (20)	Mechanics of Structures	4	1	-	100	20	30	-	-	150	5
4.	Civil Engg.	220414 (20)	Concrete Technology	4	-	-	100	20	30	-	-	150	4
5.	Civil Engg.	220415 (20)	Highway Engineering	4	1	-	100	20	30	-	-	150	5
6.	Civil Engg.	220421 (20)	Surveying – II Lab	-	-	6	-	-	-	50	20	70	3
7.	Civil Engg.	220422 (20)	Concrete Technology Lab	-	-	2	-	-	-	50	20	70	1
8.	Civil Engg.	220423 (20)	Highway Project & Lab	-	-	3	-	-	-	50	20	70	2
9.	Civil Engg.	220424 (20)	Field Visit	-	-	2	-	-	-	-	40	40	1
TOTAL				20	3	13	500	100	150	150	100	1000	30

PPA : Proficiency in Professional Activities.

L : Lecture hours : T : Tutorial hours, P : Practical hours

ESE – End of Semester Exam.; CT – Class Test; TA- Teacher’s Assessment.

Note: Students will have to go for 4 weeks Industrial Training just after the end of the 4th Semester examination. The sessional marks and the Credit will be awarded in the V Semester.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) SEMESTER : IV
 B) COURSE TITLE : SURVEYING - II
 C) CODE : 220411 (20)
 D) BRANCH/DISCIPLINE : CIVIL ENGINEERING
 E) RATIONALE

The elementary knowledge of surveying has been dealt in course surveying-I . In this course the knowledge and use of advanced method like theodolite and tachometry will given to students.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hour)			Scheme Of Examination						Credit [L+(T+P)] 2
	L	T	P	THEORY			PRACTICAL		TOTAL MARKS	
				ESE	CT	TA	ESE	TA		
220411 (20)	4	-	-	100	20	30	-	-	150	4
220421 (20)	-	-	6	-	-	-	50	20	70	3

G) DISTRIBUTION OF MARKS AND HOURS:

S.No	Chapter No	Chapter Name	Hour		Marks
			Theory	Practical	
1	1	LEVELLING	8	6	10
2	2	THEODOLITE SURVERY	12	20	20
3	3	TACHEOMETRIC SURVEY	8	12	15
4	4	TRIGNOMETRICAL SURVEY	8	12	10
5	5	MINOR INSTRUMENTS	8	12	15
6	6	SETTING OUT CURVES	12	18	20
7	7	MODERN METHODS OF SURVEYING	8	16	10
TOTAL			64	96	100

H) DETAILED COURSE CONTENTS:

Chapter-1 LEVELLING

- ☞☞Fundamental ,lines of a dumpy level and their relationship.
- ☞☞Permanent adjustment of fundamental axes of a dumpy level.

Chapter-2 THEODOLITE SURVEY

- ☞☞Types of theodolites, vernier, and digital theodolite
- ☞☞Component parts of a theodolite
- ☞☞Size of theodolite.
- ☞☞Definitions and term related to theodolite survey.
- ☞☞Fundamental axes of a theodolite
- ☞☞Temporary adjustments
- ☞☞Face left and face right observations
- ☞☞Measurement of Horizontal angle, measurement of vertical angle, checking verticality of a line
- ☞☞Miscellaneous operations with theodolite, measuring direct angles, measuring deflection angles, prolonging a straight line, fixing intermediate points. Sources of errors and their rectification

Chapter-3 TACHEOMETRIC SURVEY

- ☞☞Principles of tacheometry
- ☞☞Purpose of fixed and movable stadia hairs,
- ☞☞Computation of constants of given instrument in field
- ☞☞Movable and fixed hair method of a tacheometer with staff held vertical
- ☞☞Computation of RL and horizontal distances of staff station for different positions
- ☞☞Tangential method

Chapter-4 TRIGONOMETRICAL LEVELLING

- ☞☞Method to determine the selective altitudes in various cases,
- ☞☞Computation of R.Ls using all methods.

Chapter-5 MINOR INSTRUMENT

- ☞☞Construction and use of optical square, hand level, abney level, box sextant, pentagraph and ceylon ghat tracer. Use of planimeter and to calculate the area of irregular figure.

Chapter- 6 SETTING OF CURVES

- ☞☞Horizontal curves, designation of curve, types of curves, elements of simple curve, offsets from long chord, offsets from chord produced and deflection angle method, calculation for setting out curves, setting out curves on field.

Chapter-7 MODERN METHODS OF SURVEYING:

- ☞☞Study and use of digital instruments like digital theodolite, electronic distance measuring instruments and introduction to photographic survey.

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

~~///~~ Lecture Method.

~~///~~ Industrial visits.

~~///~~ Expert Lecture.

~~///~~ Demonstration.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books :

Sl. No.	Title	Author, Publisher, Edition & Year
1	Surveying and levelling vol II	T.P.Kanetkar Vol.II
2	Surveying	Dr. B.C. Punamia
3	Surveying	Hussain & Nagraj
4	Surveying	A Arrora

COURSE TITLE : SURVEYING – II LAB

PRACTICAL CODE : 220421 (20)

HOURS: 96

LIST OF PRACTICALS / TUTORIALS:

1. Study of parts of a theodolite and their uses.
2. Temporary adjustment of a theodolite.
3. Measurement of a horizontal angle by repetition method.
4. Measurement of a horizontal angle by reiteration method.
5. Measurement of a vertical angle.
6. To find out the R.L. of some available tall approachable object. Give the R.L. of a B.M.
7. To find out the height of a tall chimney or tower or lighting conductor.
8. Some uses of a theodolite e.g..
 - a. Prolonging a straight line.
 - b. To check the verticality of electric pole, corner of a building etc.
 - c. To fix a points at the required angles.
9. Setting out a curve in field by following methods :-
 - a. Offsets from long chord.
 - b. Offsets from tangent.
 - c. Offsets from chord produced.
10. Use of minor instruments.
 - a. Computation of area of an irregular map using planimeter
 - b. Tracing of drawing using pentagraph .
 - c. Study of Abney level, Hand level, Box sextant, Clinometer.
11. Study and use of digital theodolite
12. Study and use of total station.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **IV**
 B) **COURSE TITLE** : **PUBLIC HEALTH ENGINEERING**
 C) **CODE** : **220412 (20)**
 D) **BRANCH/DISCIPLINE** : **CIVIL ENGINEERING**
 E) **RATIONALE:**

One of the basic needs of life is water. It must be supplied to all the people in required quantity and quality. A technician should be well aware and well trained to meet the water and sanitary requirement of the public. For protection of environment, proper collection, conveyance and disposal of wastewater and solid refuse are necessary. This again reinforces the necessity of study of water supply and sanitary engineering in the civil engg. diploma programmes.

This course is aimed mainly at study of water supply and sanitary engineering. without proper arrangement for house water supply and sanitation, the purpose of municipal water supply and drainage will be defeated. As such one chapter on this topic has been included. Like all other branches of engineering, public health engg. is applicable for urban situation but since lot of our people live in the villages a chapter on rural sanitation has also been included .

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit [L+(T+P)] 2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
220412 (20)	4	1	-	100	20	30	-	-	150	5

G) DISTRIBUTION OF MARKS AND HOURS:

S.No	Chapter No	Chapter Name	Theory Hours	Marks
1	1	INTRODUCTION	2	-
2	2	QUANTITY OF WATER	9	10
3	3	SOURCES OF WATER	3	5
4	4	QUALITY OF WATER	6	5
5	5	PUMPS	8	10
6	6	PIPE AND PIPE SPECIALS	2	2
7	7	INTAKE	3	3
8	8	WATER TREATMENT PROCESS	8	10
9	9	DISTRIBUTION SYSTEM	5	5
10	10	SYSTEM OF SANITATION AND SEWERAGE	3	5
11	11	SEWER LAYING	2	5
12	12	WASTE WATER COLLECTION SYSTEM	4	5
13	13	QUANTITY OF SEWAGE	3	5
14	14	CHARACTERISTICS OF SEWAGE	2	5
15	15	SEWAGE TREATMENT PROCESSES	10	10
16	16	HOUSE WATER SUPPLY AND SANITATION	6	5
17	17	RURAL SANITATION	4	10
TOTAL			80	100

DETAILED COURSE CONTENTS:-

INTRODUCTION

- a. Natural and man made hydrological cycles as applied to P.H.E
- b. Duties of Public Health Engineer.

2. QUANTITY OF WATER

- a. Population forecast by AP,GP and incremental methods
- b. Criteria for method selection
- c. Factors influencing demand rate
- d. Variations in demand
- e. I.D. demand rates for few types of buildings
- f. Design period
- g. Fire demand
- h. Total water demand of a city

3. SOURCES OF WATER

- a. Types of sources - surface water, ground water, open well, tube well infiltration well, infiltration gallery, infiltration pipes
- b. Construction of dug well
- c. Construction of tube well by papuation method, core drilling method and rotary drilling method
- d. Well developments
- e. Will testing
- f. Yield of well.

4. QUALITY OF WATER

- a. Effects of different impurities on water / surface gound water
- b. Water borne diseases
- c. Standards of potable water
- d. Interpretation of test results
- e. Portion on sampling and testing

5. PUMPS

- a. Submersible and air lift pumps
- b. Section of pumps
- c. Characteristic curves of Centrifugal pumps
- d. WHP and BHP.

6. PIPES AND PIPES SPECIALS

- a. Type of pipes and their comparison G.I. pipe and pipe special
- b. CI pipe joints- socket, spigot and flanged
- c. Concrete pipe, collar joints
- d. Semi flexible and rigid joints for acc pipes
- e. Pressure pipes and PVC pipes
- f. Ferrous pipe- corrosion and remedies.

7. INTAKE

- a. Functions
- b. Location:- river, canal, reservoir and lake intakes.

8. WATER TREATMENT PROCESS

- a. Steps of treatment
- b. Flow diagram
- c. Coagulation
- d. Commonly used coagulants
- e. Comparison
- f. Jar test
- g. Coagulant mixing
- h. Flocculation
- i. Settling tanks- rectangular with or without mixing channel, circular with longitudinal horizontal flow
- j. Filters- slow sand, rapid, gravity and pressure filter
 - i. Construction
 - ii. Working
 - iii. Specification
 - iv. Comparison
 - v. Use.
- k. Disinfections

9. DISTRIBUTION SYSTEM

- a. Component types
- b. Functions
- c. Functional sketch of service reservoir
- d. Requirements and types of distribution systems
- e. Valves- sluice
- f. Reflux
- g. Air release, air enter,
- h. Butterfly and hydrant column (functions and uses)

- i. Service connection.

10. SYSTEMS OF SANITATION & SEWERAGE

- a. Collection of garbage,
- b. Waste water and domestic sewage
- c. Conservancy and water carried system
- d. Different system of sewerage
- e. Disposal of garbage.

11. SEWER LAYING

- a. Functions and types of sewer
- b. Sewer laying
- c. Ventilation of sewer

WASTE WATER COLLECTION system

- d. Different patterns of collection system and use
- e. Sewer appurtenances manhole on straight and junction of two sewers
- f. Drop M.H. manhole
- g. Cleanout
- h. Street inlet with kerb
- i. Channel and kerb-cum-channel inlet
- j. catch pit
- k. Oil grease trap
- l. Grit chamber
- m. Combined grit and grease chamber
- n. Flushing tank
- o. Leaping and overflow sewer
- p. Siphon spillway
- q. Ventilation shaft
- r. Sketches
- s. Functions and locations.

12. QUANTITY OF SEWAGE

- a. Sources
- b. Factors affecting quantity
- c. Variation of sewage flow
- d. Functional types of sewers

13. CHARACTERISTICS OF SEWAGE

- a. Characteristics of different types of bacteria
- b. Sewage strength
- c. Significance of different tests.

14. SEWAGE TREATMENT PROCESSES

- a. Nature of treatment by three stages
- b. Functions of screen and grit chambers
- c. Rectangular and circular settling tanks
- d. Trickling filter
- e. Flow diagram of treatment plant
- f. Disposal of liquid effluent dilution and broad irrigation , ridge and burrow

15. HOUSE WATER SUPPLY AND SANITATION

- a. Water supply and sanitary fitting-union, coupling , cocks, valve, flushing tank, nahani trap
- b. W.C-Indian, Anglo-Indian and western type
- c. Gully trap
- d. Fresh air intake
- e. Ventilating cowl
- f. Water seal
- g. Trap, anti siphonage pipe
- h. Systems of plumbing and comparison
- i. Inspection chamber
- j. Intercepting chamber
- k. Pipe special single junction, double junction

16. RURAL SANITATION

- a. Principles of rural sanitation
- b. Sources of rural water supply
- c. Disposal of garbage
- d. Sullage and night soil
- e. Design of septic tank for given uses

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- ~~✍~~ Lecture Method.
- ~~✍~~ Industrial visits.
- ~~✍~~ Expert Lecture.
- ~~✍~~ Demonstration.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books :

Sl. No.	Title	Author, Publisher, Edition & Year
1	Textbook of water supply and sanitary engg.	Hu-saon,S.K.,Oxford and IBH publishing Co.,New Delhi.
2	Textbook of water supply and sanitary engg.	Bridgie, G.S. and Bridies, J.S., Dhanpat rai & sons, Delhi.
3	Jal aputi Evem & Swachchhate Inginiary	Sunil and Rajjan Navbhart Prakashan, meerut.
4	Water pollution	Mahida,U.N.
5	Air pollution Hand book	Magill, P.L. Holden,F.R. Ackley,C. MC Graw Hill book company.
6.	The committee on PHE manual and code of practice, the ministry of health, govt. of India,PHE manual and code of practice-sectiosI,II,III and IV.	
7	I.S. 1172,1742, 2065, 2470, and 5329.	
8	Lok swasthya yatriki (in hind)	Saxena,A.K. Deeeepk prakashan, Gwalior.
9	Water supply & sewerape by	Steel
10	lk; kbj .k vflk; f=dh	f'kokum dkeM+ vkun i d'ku Xokfy; j

Field Visits:

Student will have to undergo for technical visit to the following works:

1. Water treatment plant
2. Intakes site and adjoining pumping stations
3. Sewage treatment plants.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) SEMESTER : IV
 B) COURSE TITLE : MECHANICS OF STRUCTURES
 C) CODE : 220413 (20)
 D) BRANCH/DISCIPLINE : CIVIL ENGINEERING
 E) RATIONALE

The analysis of any structural component is prerequisite for its design. The internal effects of the application of load on a member are also equally important. This course will provide necessary knowledge and skills to the students so as to analyze the effect of load on members in real life situations.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination					Total	Credit [L+(T+P)] 2
	L	T	P	Theory			Practical			
				ESE	CT	TA	ESE	TA		
220413 (20)	4	1	-	100	20	30	-	-	150	5

G) DISTRIBUTION OF MARKS AND HOURS:

S.no	Chapter no	Chapter Name	Theory Hours	Marks
1	1	INTRODUCTION	1	2
2	2	SIMPLE STRESSES & STRAINS	15	15
3	3	COMPOUND STRESSES & STRAINS	9	10
4	4	BENDING MOMENT & SHEAR FORCE	20	25
5	5	STRESSES IN BEAMS DUE TO BENDING	8	10
6	6	STRESSES IN BEAM DUE TO SHEAR	6	10
7	7	SLOPE AND DEFLECTION OF BEAMS	5	8
8	8	FIXED BEAM	10	10
9	9	COLUMN	6	10
TOTAL			80	100

H) DETAILED COURSE CONTENTS:

Chapter -1 INTRODUCTION

- ☞☞ Type of structures
- ☞☞ Structural components like slab beam
- ☞☞ Column and footing
- ☞☞ Strength & stiffness to resist failure.

Chapter -2 SIMPLE STRESSES AND STRAINS

- ☞☞ Concept of stress and strain
- ☞☞ Types of stress and strain
- ☞☞ Elasticity, elastic body
- ☞☞ Internal resistance
- ☞☞ Elongation and contracts in length
- ☞☞ Tensile test on mild steel
- ☞☞ Working stress and factor of safety
- ☞☞ Lateral strain, Poisson's ratio
- ☞☞ Change in lateral dimensions and volume
- ☞☞ Modulus of rigidity
- ☞☞ Relationship between C, E and K.
- ☞☞ Suddenly applied load and corresponding stress/strain
- ☞☞ Strain energy
- ☞☞ Resilience, proof resilience, modulus of resilience.

Chapter -3 COMPOUND STRESSES AND STRAINS:

- ☞☞ Stresses on inclined plane with different stress conditions
- ☞☞ Principal planes and principal stresses
- ☞☞ Analytical method and Graphical method using Mohr's stress circle method.

Chapter -4 BENDING MOMENT AND SHEAR FORCE:

- ☞☞ Types of support with reaction
- ☞☞ Types of beam – statically determinate/ indeterminate
- ☞☞ Cantilever, Simply supported, overhanging beams
- ☞☞ Computation of support reactions for point loads and u.d.l.
- ☞☞ Definition of B.M. and S.F. Sign convention beam.
- ☞☞ S.F & B.M diagrams for cantilever beam
- ☞☞ Simply supported and overhanging beam
- ☞☞ Point of contraflexure and its location
- ☞☞ Deflected shape of the beam
- ☞☞ Relation between B.M. and S.F. and Rate of loading.

Chapter - 5 STRESSES IN BEAMS DUE TO BENDING:

- ✍✍ Plane of bending, Simple bending
- ✍✍ Assumptions in simple bending
- ✍✍ Neutral axis and neutral layer
- ✍✍ Compute moment of inertia I_{xx} , I_{yy} , I_{cg} etc. for rectangular, circular, triangular and I-sections. Parallel axis theorem.
- ✍✍ $M/I = f/y = E/R$ its understanding and application of each term. (No derivation of the formula)
- ✍✍ Stress distribution over the section
- ✍✍ Maximum moment of resistance and its relations with maximum B.M., section modulus and its importance. $M.R. = f \cdot Z$ derivation from bending theory.

Chapter – 6 STRESSES IN BEAMS DUE TO SHEAR

- ✍✍ Expression for shear stress $q = f A_y/I. b$ and its application (No derivation)
- ✍✍ Shear stress of distribution over the sections Rectangular section, I- section, T-sections, L- section (indicating maximum values)
- ✍✍ Average and maximum shear stress for a rectangular section.

Chapter -7 SLOPE AND DEFLECTION OF BEAMS:

- ✍✍ Concept of slope and deflection and their interrelation
- ✍✍ Necessity of evaluation of slope and deflection
- ✍✍ Mecealcy's Method for determination slope and deflection
- ✍✍ Maximum values for u.d.l. and point loads for Simply supported, cantilever and fixed beams

Chapter - 8 FIXED BEAM

- ✍✍ Concept, Advantages & drawbacks
- ✍✍ Computation of fixed end moments for a fixed beam for following loading (i) single point load central/eccentric (ii) two point loads (iii) u.d.l. over entire span.
- ✍✍ Drawing of B.M. diagrams indicating the maximum +ve and –ve values.

Chapter - 9 COLUMN

- ✍✍ End conditions and equivalent length
- ✍✍ Radius of gyration and slenderness ratio
- ✍✍ Classification mode of failure, Euler's and Rankin's formula
- ✍✍ Use of Euler's and Rankin's formula in solving various problems.

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- ✍✍ Lecture Method.
- ✍✍ Industrial visits.

- ~~///~~ Expert Lecture.
- ~~///~~ Demonstration.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books :

Sl. No.	Title	Author, Publisher, Edition & Year
1	Strength of material	S. Ramamrutham
2	Mechanics of structure	S.B..Junaslears
3	Analysis of structure	Vazirani & Ratwani
4	Mechanics of structure	Dr. B.C. Punamia
5	Mechanics of structure	R.S. Kurmi

(b) Others:

- ~~///~~ VCDs
- ~~///~~ Learning Packages
- ~~///~~ Lab Manuals
- ~~///~~ Charts

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **IV**
 B) **COURSE TITLE** : **CONCRETE TECHNOLOGY**
 C) **CODE** : **220414 (20)**
 D) **BRANCH/DISCIPLINE** : **CIVIL ENGINEERING**
 E) **RATIONALE:**

Concrete is being widely used as constructional materials today due to its easy production processes, high compressive strength and the discovery of the reinforcing and pre-stressing techniques which helped to make up for its low tensile strength.

Today all the constructional works it is mainly the technicians who supervises the various construction activities. Particularly during the concreting process. A technician has the responsibility for controlling the qualities of the constructional materials specially concrete.

Therefore, students during diploma in Civil Engineering or in Construction Technology must understand the importance of the subject. Concrete technology where the characteristics and other details of the man made materials is to be taught.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hour)			Scheme Of Examination						Credit [L+(T+P)] 2
	L	T	P	THEORY			PRACTICAL		TOTAL MARKS	
				ESE	CT	TA	ESE	TA		
220414 (20)	4	-	-	100	20	30	-	-	150	4
220422 (20)	-	-	2	-	-	-	50	20	70	1

G) DISTRIBUTION OF MARKS AND HOURS:

S. No	Chapter No	Chapter Name	Hour		Marks
			Theory	Practical	
1	1	INTRODUCTION	2	-	4
2	2	TYPES OF CEMENT	10	-	14
3	3	TESTING OF CEMENT	6	8	12
4	4	AGGREGATES AND THEIR TESTING	10	8	10
5	5	FRESH CONCRETE	12	8	20
6	6	STRENGTH OF CONCRETE	12	-	20
7	7	CONCRETE MIX DESIGN	12	8	20
TOTAL			64	32	100

H) DETAILED COURSE CONTENTS:

Chapter-1 INTRODUCTION

- ☞ Concrete and its ingredients and their functions
- ☞ Various mixes and grades
- ☞ Various types of concrete and their uses
- ☞ Types of cement and their properties

Chapter-2 TYPES OF CEMENT AND ADMIXTURES:

- ☞ Ordinary Portland cement
- ☞ Rapid hardening cement
- ☞ Quick setting cement
- ☞ Low heat cement
- ☞ Portland pozzolana cement
- ☞ Coloured cement
- ☞ High strength cement
- ☞ High alumina cement
- ☞ Sulphate resistant cement
- ☞ Chemical composition, properties and uses of various types of additives & admixtures-uses and function
- ☞ Heat of hydration
- ☞ Water requirement for hydration

Chapter -3 TESTING OF CEMENT

- ✍✍ Field testing and laboratory testing
- ✍✍ Fineness test
- ✍✍ Setting time test
- ✍✍ Strength test
- ✍✍ Soundness test
- ✍✍ Heat of hydration test

Chapter 4 AGGREGATES AND THEIR TESTING

- ✍✍ Classification on the basis (i) source (ii) size (iii) shape (iv) texture
- ✍✍ Strength of aggregates
- ✍✍ Aggregate impact value
- ✍✍ Aggregate abrasion value
- ✍✍ Modulus of elasticity
- ✍✍ Bulk density
- ✍✍ Specific gravity
- ✍✍ Absorption and moisture content
- ✍✍ Bulking of aggregates
- ✍✍ Measurement of moisture content of aggregates by (i) drying method (ii) displacement method
- ✍✍ Cleanliness, soundness of aggregates
- ✍✍ Grading of aggregates
- ✍✍ Sieve analysis
- ✍✍ Specific surface and surface index
- ✍✍ Standard grading curve.
- ✍✍ Testing of aggregates (i) flakiness index (ii) elongation index (iii) test for determination of clay, fine silt and fine dust (iv) specific gravity test (v) bulk density and voids (vi) test for aggregate crushing value (vii) ten percent fines value test (viii) aggregate impact value test. Aggregate abrasion value test.
- ✍✍ Suitability of different aggregates for different concrete works

Chapter -5 FRESH CONCRETE

- ✍✍ Workability
- ✍✍ Factors affecting workability
- ✍✍ Measurement of workability by (i) slump test (ii) compaction factor test (iii) flow test (iv) vee bee consistometer test, segregation and bleeding

- ✍✍ Process of manufacture of concrete (i) batching (ii) mixing (iii) transporting (iv) placing (v) compacting (vi) curing (vii) finishing and detailed description. Form work and its removal
- ✍✍ safety precautions observed
- ✍✍ Tools and plants

Chapter -6 STRENGTH OF CONCRETE

- ✍✍ Strength of concrete
- ✍✍ Water/cement ratio
- ✍✍ Gel / space ratio
- ✍✍ Gain of strength with age
- ✍✍ Maturity concept of concrete
- ✍✍ Effect of maximum size of aggregates on strength
- ✍✍ Relation between compressive and tensile strength
- ✍✍ Bond strength
- ✍✍ Aggregate cement bond strength
- ✍✍ High strength concrete
- ✍✍ Joints in concrete work-their position and types
- ✍✍ Lasting of concrete-destructive and non destructive
- ✍✍ Related Indian standard numbers and its contents for all ingredients of concrete

Chapter- 7 CONCRETE MIX DESIGN

- ✍✍ Concrete mix design
- ✍✍ Variables in proportioning
- ✍✍ Methods of proportioning
- ✍✍ Statistical quality control of concrete
- ✍✍ Common terminologies (a) mean strength (b) variance (c) standard deviation (d) coefficient of variation
- ✍✍ Methods of mix design by Indian standard method(I.S. code 10262-1982) & demonstration
- ✍✍ Special types of concrete

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- ✍✍ **Lecture Method.**
- ✍✍ **Industrial visits.**
- ✍✍ **Expert Lecture.**
- ✍✍ **Demonstration.**

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books :

Sl. No.	Title	Author, Publisher, Edition & Year
1	Concrete tech.	vajirani
2	Concrete tech.	S.P. Chandola
3	Concrete tech.	R.S. Varshney
4	Concrete tech.	M.S. Setty
5	Concrete tech.	B.L. Gupta
6	Concrete Technology (Hindi)	Shivanand Kamde
7	I.S.Code 269,383,455,516,1999,1489,1791,2386,2505,2506,2514,12269 ,12330,12600	

COURSE TITLE : CONCRETE TECHNOLOGY LAB

PRACTICAL CODE : 220422 (20)

HOURS: 32

LIST OF PRACTICALS / TUTORIALS:

1. Fineness test on cement by sieving .
2. Determination of initial setting time of cement.
3. Determination of final setting time of cement.
4. Soundness test on cement.
5. Test for determination of flakiness index.
6. Test for determination of specific gravity.
7. Test for determination of bulk density and voids.
8. Test for determination of aggregates crushing value.
9. Test for determination of aggregates impact value.
10. Determination of workability by slump test.
11. Determination of compressive strength of concrete cubes.
12. Mix design of concrete by Indian standard method.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **IV**
 B) **COURSE TITLE** : **HIGHWAY ENGINEERING**
 C) **CODE** : **220415 (20)**
 D) **BRANCH/DISCIPLINE** : **CIVIL ENGINEERING**
 E) **RATIONALE:**

One of the job functions of a civil engineering technician is construction and maintenance of highways and bridges. This needs knowledge of planning and development of highways, preliminary surveys and construction of highways.

This curriculum of highways engg. is also intended so develop abilities in the field of highway projects, so that technician can select, equipments & supervise construction of roads and also to maintain them by solving live problems at site.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination					Total	Credit [L+(T+P)] 2
	L	T	P	Theory			Practical			
				ESE	CT	TA	ESE	TA		
220415 (20)	4	1	-	100	20	30	-	-	150	5
220423 (20)	-	-	3	-	-	-	50	20	70	2

F) DISTRIBUTION OF MARKS AND HOURS:

Sl. No.	Chapter No.	CHAPTER NAME	Hours		Marks
			Theory	Practical	
1	1	INTRODUCTION	05	-	05
2	2	INVESTIGATION & PLANNING OF NEW ROADS	10	-	10
3	3	ROAD GEOMETRIC	20	-	20
4	4	PAVEMENT DESIGN, MATERIALS AND CONSTRUCTION	25	28	30
5	5	DRAINAGE OF ROADS	4	-	10
6	6	TRAFFIC ENGINEERING	8	-	10
7	7	ARBORICULTURE	2	-	5
8	8	ROAD MAINTENANCE	4	-	10

Sl. No.	Chapter No.	CHAPTER NAME	Hours		Marks
			Theory	Practical	
8	9	PROJECT	-	20	-
TOTAL			80	48	100

H) DETAILED COURSE CONTENTS:

Chapter – 1 INTRODUCTION

- ☞☞ Role of roads in national development
- ☞☞ Improvement of roads in various fields
- ☞☞ Development of highway system
- ☞☞ Classification of roads as per Indian Road Congress
- ☞☞ Road Development plans of India

Chapter – 2 INVESTIGATION & PLANNING OF NEW ROADS

- ☞☞ Road patterns
- ☞☞ Reconnaissance survey
- ☞☞ Map-study and preliminary survey
- ☞☞ Detailed objects
- ☞☞ Marking of various alignment and various drawings and reports
- ☞☞ Steps in a new project work

Chapter – 3 ROAD GEOMETRIC

- ☞☞ Cross section of various types of roads as per I.R.C. design criterion
- ☞☞ Pavement surface characteristics
- ☞☞ Kerb and road margins
- ☞☞ Gradient and its standard values
- ☞☞ Camber and its standard values
- ☞☞ Super elevation and its max., min. values
- ☞☞ Calculation of super elevation
- ☞☞ Radius and degree of curve
- ☞☞ Widening of roads
- ☞☞ Mechanical & Psychological widening
- ☞☞ Sight distance
- ☞☞ Stopping sight distance
- ☞☞ Overtaking sight distance
- ☞☞ Reaction time
- ☞☞ Transition curves their function and purpose
- ☞☞ Vertical curves

Chapter – 4 PAVEMENT DESIGN MATERIALS & CONSTRUCTION

- ☞☞ Pavement “Cross-section” element and their functions,
- ☞☞ Pavement types
- ☞☞ Road materials and their qualities
- ☞☞ Design factors for various types of pavements
- ☞☞ CBR value
- ☞☞ Material used in highway construction their qualities
- ☞☞ Various tests of materials
- ☞☞ Construction of earth roads,
- ☞☞ Gravel roads, WBM Roads
- ☞☞ Bituminous pavements,
- ☞☞ Cement concrete pavements and joints in cement concrete pavements
- ☞☞ Slopes, bedding, earthwork in cutting, filling
- ☞☞ Method of giving layout.

Chapter – 5 DRAINAGE OF ROADS

- ☞☞ Importance of Highway drainage & Road drainage
- ☞☞ Requirements of road drainage system
- ☞☞ Surface drainage system
- ☞☞ Cross drainage and subsurface drainage
- ☞☞ Empirical formula used in construction of roads in water logged areas
- ☞☞ Layout of drainage system

Chapter – 6 TRAFFIC ENGINEERING

- ☞☞ Traffic surveys
- ☞☞ Classification of traffic
- ☞☞ Channelisations
- ☞☞ Traffic controlling devices
- ☞☞ Traffic signals & their classification

Chapter – 7 ARBORICULTURE

- ☞☞ Road side arboriculture and its necessity
- ☞☞ Planning of plantation of trees
- ☞☞ Selection of types of trees
- ☞☞ Developments of nursery considering the environment aspects

Chapter – 8 ROAD MAINTENANCE

- ☞☞ Defects of Roads and various pavements
- ☞☞ Pavements failures, causes and repairs
- ☞☞ Defects in cement concrete roads, causes of defects
- ☞☞ Repairing procedure
- ☞☞ Strengthening of existing pavements

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- ☞☞ Lecture Method.
- ☞☞ Industrial visits.
- ☞☞ Expert Lecture.
- ☞☞ Demonstration.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books :

Sl. No.	Title	Author, Publisher, Edition & Year
1	Highway Engg.	S.K.Khanna &C.E. Justo
2	Highway Engg.	N.K. Vashwani
3	Highway Engg.	S.B. Sehgal
4	Principles & Practice of Highway Engg.	L.R. Kadiyali
5	A course in Highway Engg.	S.P. Bindra
6	Fundamental Principles of Road Engg.	V.B. Priyant
7	Indian Roads Congress	IRC Publications
8	Traffic Engineering	Shivanand Kamde, Deepak Pub. Gwalior

COURSE TITLE : HIGHWAY ENGINEERING LAB

PRACTICAL CODE : 220423 (20)

HOURS: 48

LIST OF PRACTICALS / TUTORIALS:

- ✍* A Highway Engineering Project which includes different types of survey, preparation of Alignment Plan, L- Section & X-Section of Road
- ✍* Testing for highway construction materials

1. To determine Grading of coarse aggregate
2. To determine Impact value of given aggregate
3. To determine Crushing value of given aggregate
4. To determine Abrasion value of given aggregate
5. To determine Specific gravity of given aggregate
6. To determine Flakiness and Elongation index of given aggregate
7. To determine Penetration value of Bitumen/Tar
8. To determine Ductility test of Bitumen/Tar
9. To determine Flash and Fire point of Bitumen/Tar
10. To determine Softening point of Bitumen/Tar
11. To determine Viscosity test of Bitumen/Tar
12. To conduct CBR test of sub base and sub-grade materials
13. Study of Marshall Stability Test apparatus
14. Study of Blenkan Man's Beam Test apparatus.
