

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH- CIVIL ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

Sem: III (3rd)	Total Hours Distribution per week		
Total Credit : 4	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 1 Hr.	
Subject Code	BTCVE301T	APPLIED MATHEMATICS-III	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	The aim is to introduce and develop the advanced Mathematical Skills of Engineering students that are imperative for effective understanding of Civil Engineering subjects.
2	The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enrich logical thinking power.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply Fourier series in the analysis of periodic functions not in terms sine and cosine encountered in engineering problems
2	Solve Partial differential equations of first, higher and second order using elementary techniques; formulate mathematical models to simple problems of vibration of strings and beams in terms of Partial differential equations and solving with elementary solution techniques.
3	Learn the concept of finding maxima and minima of definite integral involving unknown function and its derivatives.

4	Learn Eigen value problem and its applications.
5	Learn to find an approximate solution of algebraic and transcendental equations, system of linear equations and first order ordinary differential equations by various Numerical Methods
6	Formulate simple optimization problem and learn to solve it by Graphical method and Simplex method.

MAPPING OF CO WITH PO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1												
2												
3												
4												
5												

1 Low

2 Medium

3 High

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BTCVE301T - APPLIED MATHEMATICS-III

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 (FOURIER SERIES)			
Periodic functions and their Fourier expansions, Even and Odd functions, Half range expansion.	5	1	1
UNIT NO.2 (PARTIAL DIFFERENTIAL EQUATIONS)			
Partial Differential Equations of first order first degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Applications to simple problems of vibration of strings and beams.	10	1	2
UNIT NO.3 (CALCULUS OF VARIATIONS)			
Maxima and minima of functional, Euler's equation, Functionals dependent on First & Second orders derivatives.	5	1	3

UNIT NO.4 (MATRICES)			
Linear dependence of vectors, Characteristics equations, Eigen values and Eigen vectors. Reduction to diagonal form, Sylvester's theorem, Quadratic form, Association of matrices with linear differential equation of second order with constant coefficients.	8	1	4
UNIT NO.5 (NUMERICAL METHODS)			
Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Seidel method, Crouts method. Numerical solution of ordinary differential equation :Taylor's series method, Picard's method, Runge- Kutta 4 th order method, Euler modified method and Milne ' s Predictor- Corrector method.	12	1	5
UNIT NO.6(INTRODUCTION TO OPTIMIZATION TECHNIQUES)			
Linear programming problem: Formulation, Graphical method, Simplex method.	8	1	6

References			
Name of Book	Name of Author	Name of Publisher	Edition
Higher Engineering Mathematics	B.S. Grewal	Khanna Publication	40 th
Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India	8 th
Applied Mathematics for Engineers & Physicist	L.R. Pipes and Harville		
Calculus of variation	Forrey		
A Text Book of applied Mathematics, Volume I & II	P.N. Wartikar & J.N. Wartikar	Poona Vidyarthi Griha Prakashan	
Introductory methods of Numerical Analysis	S.S. Sastry	PHI	
Mathematics for Engineers	Chandrika Prasad		
A text book of Engineering Mathematics	N. P. Bali & M. Goyal	Laxmi Publication	

*Shrihari
Chavhan*

A. N. Dabhade
(Dr. A.N. Dabhade)
BOS member

Dr. Avinash N. Shrikhande
(Dr. Avinash N. Shrikhande)
BOS (Civil Engg) chairman

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Sem: III (3rd)	Total Hours Distribution per week		
Total Credit:3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): NA	Practical (P): 1 Hr.
Subject Code	BTCVE302T	FLUID MECHANICS	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To impart the importance and practical significance of various fluid properties
2	To discuss and evaluate various forces acting on partially and fully submerged bodies
3	To discuss and evaluate the importance of various parameters on the fluid motion.
4	To discuss various flow measuring devices with their practical applications
5	To deliberate the concept of impulse momentum principle, dimensional analysis and model analysis of a fluid phenomenon

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the importance and practical significance of various fluid properties
2	Comprehend and estimate various forces acting on partially and fully submerged bodies
3	Evaluate the importance of various parameters on the fluid motion.
4	Know various flow measuring devices with their practical applications
5	Illustrate the concept of impulse momentum principle, dimensional analysis and model analysis of a fluid phenomenon

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code & CO NO.												
CO1	3	3										
CO2	3	3	1									
CO3	3	3	2									
CO4	3	3	1									
CO5	3	3	2	1								

1 Low

2 Medium

3 High

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B.TECH - CIVIL ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

BTCVE302T - FLUID MECHANICS

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 (INTRODUCTION)			
<p>1. Fluid Mechanics and its importance in Civil Engineering, Rheological diagram and its significance.</p> <p>2. Fluid Properties: Basic Properties, Viscosity and its Significance, Surface Tension, Capillarity, Compressibility, Vapour Pressure.</p> <p>3. Pressure and its measurement: Pressure at a point and its representation, atmospheric and gauge pressure, Pressure measurement by manometer, information about mechanical and digital pressure gauges.</p>			
UNIT NO.2			
<p>1. Hydrostatics: Total Pressure and centre of pressure on for a plane surface and curved surface immersed in fluid. Numerical Problems.</p> <p>2. Stability of Floating Bodies: Archimedes Principle, Metacentre and centre of buoyancy, Metacentric height and its determination, Stability of floating bodies partially submerged and fully submerged.</p> <p>3. Fluid masses subjected to relative equilibrium, effect of horizontal and vertical acceleration on the moving fluid masses.</p>			
UNIT NO.3			
<p>1. Kinematics of Flow: Euler and Lagrangian approaches, velocity and acceleration of fluid, local and convective acceleration, Continuity equation, Stream function and velocity potential functions, Streamline, Path line and streak lines.</p> <p>2. Kinetics of Flow: Forces acting on a fluid mass, Euler's Equation of motion, Bernoulli's Equation.</p>			

UNIT NO. 4			
Flow measuring Devices:			
(a) For pipeline- Venturimeter, orifice meter, Nozzle meter, Pitot Tube for velocity measurement			
(b) For tank- Orifice and its types, hydraulic coefficients, mouth piece and its types.			
(c) For Open Channel- Notches and weirs, velocity of approach, End contraction, Sharp crested, broad crested weir and Labrynth weir			
UNIT NO. 5			
1. Impulse momentum principle and its application, impact of jet, concept of velocity triangle.			
2. Dimensional Analysis , Dimensionally Homogenous equation, Methods of Dimensional Analysis, Dimensionless numbers			
3. Model Analysis : Types of similarities, Reynold's and Froude's model law, Distorted and Undistorted model.			

References			
Name of Book	Name of Author	Name of Publisher	Edition
Hydraulics, Fluid Mechanics and Hydraulic Machines	P.N. Modi & S.M. Seth	Standard Book House, Delhi	21 st (2017)
A Text Book of Fluid Mechanics and Hydraulic Machines	R.K. Bansal	Laxmi Publications (P) Ltd., New Delhi	9 th (2005)
A Text Book of Fluid Mechanics and Hydraulic Machines	R.K. Rajput	S Chand & Company (P) Ltd., New Delhi	6 th (2015)
Fluid Mechanics including Hydraulic Machines	A.K. Jain	Khanna Publishers	(2006)
Hydraulics, Fluid Mechanics and Fluid Machines	S. Ramamrutham	Dhanpat Rai Publishing Co., New Delhi	9 th (2011)

STUDIOS
Ceratos G. Shenale

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 (Dr. Avinash N Shrikhande,
 BOS (Civil Engg) chairman

Aashuher
 Dr. A.N. Dabhade
 BOS member

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B.TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)**

Sem: III(3rd)	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BTCVE302P	FLUID MECHANICS	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments:

1. Determination of Metacentric height and its importance.
2. Calibration of Venturimeter and its practical utility
3. Calibration of Orifice meter and its practical utility
4. Calibration of Rectangular Notches/ V-Notches.
5. Calibration of Rectangular Notches/ V-Notches
6. Hydraulic Coefficients of an orifice.
7. Hydraulic Coefficients of a Mouthpiece.
8. Verification of Bernoulli's Theorem
9. Impact of jet apparatus

*Shrihari
C. S. Shinde*

A. N. Dabhade
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Sem: III (3rd)	Total Hours Distribution per week		
Total Credit : 4	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 1 Hr.	
Subject Code	BTCVE303T	SOLID MECHANICS	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To determine the Mechanical behavior of the body by determining the stresses, strains produced by the application of load and to apply the fundamentals of simple stresses and strains.
2	To determine the Shear Force and Bending Moment at a section for different condition.
3	To facilitate the concept of bending and its theoretical analysis in a beam To determine the Bending and shear stress in a given beam.
4	To develop slope and Deflection equations for beams subjected to various loads.
5	To determine the torsion in circular section, Direct and Bending Stresses

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the behaviour of materials under different stress and strain conditions.
2	Evaluate and draw shear force diagram and bending moment diagram and their relation.
3	Formulate the bending and shear stresses equations and able to draw bending and shear stress diagrams.
4	Formulate slope and Deflection equations for beams subjected to various loads by Macauleys method
5	Analyze and Evaluate the torsion in circular section, Direct and Bending Stresses

MAPPING OF CO WITH PO

CO/PO ↓ →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3	3						1		3
2	3	3	3	3						1		3
3	3	3	3	3						1		3
4	3	3	3	3	1					1		3
5	3	3	3	3	1					1		3

1 Low

2 Medium

3 High

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(CHOICE BASED CREDIT SYSTEM)
BTCVE303T - SOLID MECHANICS

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 (STRESS AND STRAIN)			
Concept of stress and strain, Stress-Strain diagrams and their Characteristics for mild steel and TOR Steel.	2	1	1
Stresses and strains in simple, composite bars in uniaxial tension and compression,	3	1	
Temperature stresses in simple restrained bars, composite bar.	2	1	
Elastic Constants and Relation between them. Introduction to Biaxial And triaxial loading.	1	1	
UNIT NO.2 (SHEAR FORCE AND BENDING MOMENT)			
Types of Beams. Shear Force and Bending Moment	1	1	2
Relation between Bending Moment and Shear Force	1	1	
Bending Moment Diagram and Shear Force Diagrams	5	1	
UNIT NO.3 (STRESSES IN BEAMS)			
Bending Stresses in Beams, Assumptions and derivation of simple bending theory	2	1	3
relation between bending moment, bending stress and curvature of homogeneous and composite beams,	2	1	
Shear stresses in simple beams, Shear flow and shear stress distribution,	2	1	
shear stress in composite beams, combined effect of bending moment and axial force.	2	1	
Principal stresses, maximum shear stresses	2	1	

UNIT NO.4 (DEFLECTION OF BEAMS)			
Differential equations of the deflection curve. Bending of uniformly loaded beams.	1	1	4
Deflection of simply supported beam loaded by a concentrated load.	2	1	
Introduction to Macauleys method. Deflection of a simply supported and cantilever beam by the Macauleys method.	2	1	
Method of superposition. The deflection of beams with overhangs.	2	1	
UNIT NO.5 (TORSION, DIRECT AND BENDING STRESSES)			
Direct and Bending Stresses	2	1	5
Torsion of circular section, assumptions and derivation of relations Between torsional moments, shear stress and angle of twist.	3	1	
Torsion in thin walled hollow section closely coiled helical springs.	2	1	

References			
Name of Book	Name of Author	Name of Publisher	Edition
Strength of Materials	S. Ramamrutham	Dhanpat Rai	
Strength of Materials	Dr. R K Bansal	Laxmi Publication	5 th
Strength of Materials	S.P. Timoshenko	Mc. Graw Hill	
Mechanics of Materials	Ferdinand P.Beer, E. Russell Johnston Jr.	Mc. Graw Hill	
Strength Of Materials	F.L. Singer	Haper and Row	
Schaum's outline of Strength of Materials	William A. Nash	Mc. Graw Hill	
Applied Mechanics and Strength of Materials	A. B. Clemens	International text book company 1906	

STUDIES
Carsten G. Brendel

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A. N. Dabhadre
 DR. A.N. Dabhadre
 BOS member

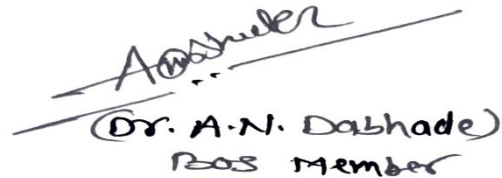
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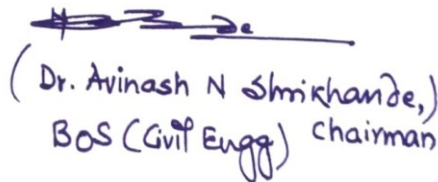
Sem: III (3rd)	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs.		
Subject Code	BTCVE303P	SOLID MECHANICS	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments: (Any Six)

1. To Study Various Types of Strain Gauge Apparatus
2. To Determine The Tensile Strength of Steel Specimen
3. To Perform Hardness Test on Various Metals.(Brinnell Hardness Test &Dynamic Hardness Test.)
4. To Perform Standard Torsion Test on Metals
5. To Perform The Impact Test on Metal (Izod/ Charpy)
6. To Determine The Spring Constant of Closely Coiled Spring .
7. To Perform Shear Test on Different Metals
8. To Perform Fatigue Test on Mild Steel Bar.
9. To Perform Bending Test on Wooden Beam And Find Its Flexural Rigidity


(Prakash G. Sonale)


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Sem: III (3rd)	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): NA	Practical (P): 2 Hrs.
Subject Code	BTCVE304T	GEOTECHNICAL ENGINEERING	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To impart knowledge about index properties and their determination.
2	Introduce to the students, the principle permeability and seepage in the soil.
3	To impart knowledge about engineering properties and their determination.
4	Familiarize the students with the procedures used for Shallow and Deep foundation.
5	To impart knowledge about Basic Geology.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Find the index and engineering properties of the soil.
2	Determine properties & demonstrate interaction between water and soil.
3	Analyze and compute principles of compaction and consolidation settlements of soil.
4	Ability to analyze to calculate bearing capacity, earth pressure and foundation settlement.
5	Study and identify different type's natural materials like rocks & minerals and soil.

MAPPING OF CO WITH PO

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

1 Low

2 Medium

3 High

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(CHOICE BASED CREDIT SYSTEM)
BTCVE304T- GEOTECHNICAL ENGINEERING
SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 (INTRODUCTION AND PHASES OF SOIL)			
Formation of soil, residual & transported soil, major deposits found in India.	1		1
Soils generally used in practice such as sand, gravel, organic soil, clay, Betonies, black cotton soil etc.	1		1
Various soil weight & volume inter-relationship.	1		1
Index Properties & Their Determination, Water content, specific gravity, sieve analysis, particle size distribution curve, sedimentation analysis.	2		1
Consistency of soil, Atterberge's limits.	2		1
Classification of Soil: Particle size classification, Textual classification, Unified & I.S. classification system.	2		1
UNIT NO.2 (PERMEABILITY, SEEPAGE & STRESS DISTRIBUTION)			
Darcy's law & its validity, Discharge & seepage velocity, factors affecting permeability.	1		2
Determination of coefficients of permeability by Laboratory and field methods.	1		2
Permeability of stratified soil. insitu permeability test.	1		2
Seepage pressure, quick sand condition, characteristics & uses of	1		2

flownets.			
Preliminary problems of discharge estimation in homogeneous soils, Effective, Neutral and total stresses in soil mass. Piping, filter criteria.	1		2
UNIT NO.3 (CONSOLIDATION & COMPACTION)			
Compression of laterally confined soil, Terzaghis 1-D consolidation theory (formation of Differential equation).	1		3
Determination of coefficient of consolidation, Degree of consolidation.	1		3
Determination of preconsolidation pressure, Settlement, Rate of settlement.	1		3
Compaction: Mechanism of compaction, factors affecting compaction.	1		3
Standard & modified proctor Tests, field compaction equipments, quality control.	1		3
Advance compaction Techniques, Nuclear density meter.	1		3
Shear Strength: Introduction, Mohr Coulomb's theory, Drainage condition.	1		3
Measurement of shear strength by direct shear test, triaxial test, unconfined compression test.	1		3
Vane shear test, sensitivity. Shear strength of clays and sands.	1		3
UNIT NO.4(SHALLOW & DEEP FOUNDATION)			
Bearing capacity of soil: Factor affecting bearing capacity, Terzaghis theory.	1		4
Its validity and limitation, types of shear failure in foundation soil.	1		4
Effect of water table on bearing capacity, Settlement of shallow foundation.	1		4
Classification of piles, constructional features of cast- in – situ & pre cast concrete piles.	1		4
Pile driving methods, effect of pile driving on ground.	1		4
Pile capacity by static formula & dynamic formulae spacing of piles in group, negative skin friction and its effect on pile capacity.	1		4

UNIT NO.5 (PHYSICAL GEOLOGY)			
Introduction and scope of Geology and subdivision ,Internal structure of the earth, Weathering, erosion and denudations process on earth material and natural agencies	1		5
Geological work of wind, river underground water and glaciers.	1		5
Earthquakes: Basics of earthquake, earthquake history, seismic activity, concept of intensity and magnitude of earthquake, causes of earthquake	1		5
Influence on civil structures and engineering consideration, seismic zonation, Stratigraphy of INDIA-Introduction.	1		5

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edit ion	Category		
					Text Book	Research paper	Reference book
1,2,3,4,5,	Soil Mechanics & Foundation Engg	B.C.Punmia	Laxmi Publication		Yes		
1,2,3,4,	Soil Mechanics & Foundation Engg	K.R. Arora	Std. Publisher		Yes		
1,2,3,4,	Soil Mechanics & Foundation Engg	Modi	Std. Publisher				Yes
1,2,3,4,	Soil Mechanics & Foundation Engg	V.N.S.Murthy	CBS Publisher				Yes
5	Geology for Engineers		FGH Blyth		Yes		
5	Basic Geotechnical Earthquake Engineering	Kamalesh Kumar			Yes		

List of Code/Handbook

Applicable for Unit No.	Title of Code	Type of code	Year of Publication
2,5	Geotechnical Handbook by B.M.Das		2011
2	Methods of test for soils, IS : 2720 (Part VII-1980)	Indian Standard	AUGUST 1997
3	Methods of test for soils, Laboratory determination of Permeability, IS 2720-PART-17-1986).	Indian Standard	Reaffirmed 2002
2	I.S. 2720 (Part-29) : 1975 (Reaffirmed 1988) core cutter method. I.S. 2720 (Part 28) : 1974 (Reaffirmed 1988) Sand replacement method.	Indian Standard	Reaffirmed 1995
4	Methods of test for soils, Direct shear test, I.S. 2720 (Part-XIII) 1965.	Indian Standard	Reaffirmed 2002
5	Methods of test for soils, Proctor Test, I.S. 2720 (Part-VIII) – 1965	Indian Standard	SEPTEMBER 1994

Applicable for Unit No.	Website address
1	https://www.geoengineer.org/education/soil-mechanics
1	http://civilengineering-notes.weebly.com
2	https://www.geoengineer.org/education/soil-mechanics
2	https://nptel.ac.in
3	https://www.slideshare.net/prasadprabhu50/chapter-3-compaction-and-consolidation
4	https://nptel.ac.in/content/storage2/courses/105101083/download/lec17.pdf
4	https://www.slideshare.net/jagrutib22/all-about-deep-foundations
5	https://sites.google.com/site/3rdsemnotes/engineering-geology

Signature
Arjun G. Bhande

Signature
 (Dr. A.N. Dabhade)
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Signature
 (Dr. Avinash N Shrikhande,
 BOS (Civil Engg) chairman

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B. TECH CIVIL ENGINEERING
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Sem: III (3rd)	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs.		
Subject Code	BTCVE304P	GEOTECHNICAL ENGINEERING	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments :

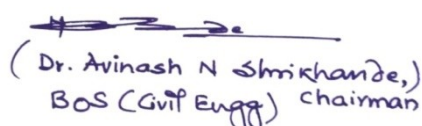
A. Any 10

1. Moisture content and Specific gravity of soil.
2. Grain size Analysis – (Sieve Analysis).
3. Consistency limit, plastic limit and liquid limit of soil.
4. Hydrometer Analysis.
5. Constant Head Permeability test of or Falling Head Permeability test.
6. Consistency limit of soil (shrinkage limit).
7. Field Density by sand replacement method.
8. Field Density by core cutter method.
9. Unconfined compression test.
10. Direct shear Test.
11. Triaxial shear test (Demonstration).
12. Study of Plate load Test.
13. Proctors compaction Test and Proctor needle test.

B. One field visit or one case study included in journal.

C. Use of plasticity Chart or Newmarks Chart.


 Carlos G. Senele


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(CHOICE BASED CREDIT SYSTEM)

Sem: III (3rd)	Total Hours Distribution per week		
Total Credit: 2	Lecture (L): 3Hrs	Tutorial/Activity (T/A): NA	Practical (P): 1 Hr.
Subject Code	BTCVE305T	BUILDING CONSTRUCTION & ELEMENTARY BUILDING DRAWING	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To prepare the students to understand components of buildings and their functions.
2	To prepare students to understand execution of various constructions activities and material.
3	To prepare students to analyse behaviour of structure under different environmental conditions.
4	To prepare students to identify & suggest rectification the various defects in civil engineering works.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Identify components of a building.
2	Differentiate and identify types of building materials.
3.	Select appropriate material for building construction.
4.	Plan various construction related activities and their quality control.
5.	Know & identify the latest techniques and materials used.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code & CO NO.												
1	3											2
2		2			1							3
3					3							
4				3								
5		2										3

1 Low

2 Medium

3 High

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY,
NAGPUR FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)
BTCVE305T - BUILDING CONSTRUCTION &
ELEMENTARY BUILDING DRAWING**

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 (FOUNDATIONS)			
Foundations: Necessity and types of R.C.C. foundations, Detail of Deep foundation and precast foundation in general, Details shallow foundations.	3		4
Bearing capacity of soils and its assessment. Preumptive bearing capacity values from codes. Loads on foundations. Causes of failures of foundations and remedial measures,	2		4
Foundation on black cotton soils Setting out foundation trenches, excavation timbering of foundation trenches. Load bearing and framed structures.	2		4
	7		
UNIT NO.2 (BRICKWORK AND STONE WORK)			
Qualities of good bricks, classification of bricks, Terms used in brickwork, commonly used types of bonds in brickwork such as header, stretcher, English and Flemish bonds, principles of construction. Reinforced brickwork.	2		2
Parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls. Masonry construction using cement concrete blocks and clay blocks, load bearing and partition walls. Precast construction: Introduction to method and materials. Precast elements likes poles, cover, jellies, steps corbels, truss element etc.	2		3
Selection of stones types of stone masonry, principles of construction	2		2

<p> Joints in masonry. Lifting heavy stones, common building stones in India. </p>			
<p> Arches and Lintels: Terminology in contraction, types chajjas and canopies, pre cast Lintels & Arches. </p>	2		3
	8		
<p>UNIT NO.3 (DPC, FLOORS AND ROOFS)</p>			
<p> Damp Proofing: Causes and effect of dampness. Various methods of damp proofing Damp proofing in plinth protection, New Techniques of Damp Proofing Damp Proofing in Plinth Protection, New Techniques of Damp proofing. Epoxy etc. </p>	3		3
<p> Floors: General principals, types and method of construction, floors finished quality, testing floor tiles, synthetic & Ceramic Tiles. </p>	2		1
<p> Roofs: Flat and pitches roofs, roof coverings, types AND their constructional features. Thermal Insulation </p>	2		5
	7		
<p>UNIT NO.4 (STAIRS, DOORS AND WINDOWS)</p>			
<p> Stairs: Types of stairs, functional design of stairs. </p>	3		4
<p> Doors and Windows: Purpose materials of construction and types. </p>	4		4
	7		
<p>UNIT NO.5 (PLASTERING AND POINTING, PAINTING)</p>			
<p> Plastering and Pointing : Necessity, types and methods </p>	2		2
<p> Temporary Timbering: Centering and formwork shoring, underpinning and scaffolding. </p>	3		2
<p> Painting: White washing, colour washing and distempering new materials & Techniques. </p>	2		2
	7		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1 to 5	Building Construction	by Rangwala	Charotar Pub. House				yes
1 to 5	Building	G. S.	Dhanpat		yes		

	Construction & Construction Materials	Birde & T. D. Ahuja	Rai Pub. company				
1 to 5	Building Construction	Arun kr. Jain Ashok kr. Jain B. C. Punmia	Laxmi	11th			yes
1 to 5	Building Construction	Gurucharan singh	Standard Book House		yes		

Stavros
Costas G. Panagiotou

~~Dr. Avinash N. Shrikhande~~
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A. N. Dabhadre
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BOS member

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY,
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B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)**

Sem: III (3rd)	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs.		
Subject Code	BTCVE305P	BUILDING CONSTRUCTION & ELEMENTARY BUILDING DRAWING	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments:

1. Development of a given line plan of a residential building.
Draw to a scale of 1: 50
 1. Detailed Plan.
 2. Elevation.
 3. Section.
2. Following Sketches pertaining to the above plan (with Standard Dimensions)
 - a. Door- Panelled door
 - b. Window
 - c. Stair
 - d. Masonry
 - e. Lintel
3. Students should prepare working drawing of Foundation Plan (on tracing paper) for the above Residential Building Plan. It should contain detailed foundation plan with foundation details. (Use suitable scale 1:50 or 1:100)
4. Draw sketches using computer software of the following:
 1. Foundations- two plates
 - a) Line sketches of shallow and deep footing.
 - b) Details of any one of the shallow footings.
 2. Arches- two plates.
 - a) Different types of arches
 - b) Details of arch showing different components
 3. Trusses- one plate. (Showing different components)

5. One seminar report and presentation based on various aspects of Modern materials and construction methods.

6. Site visit and technical report on the visit (Minimum Two).

(Visit should contain Stage of visit, related sketches of components-C/S-Dimensions, Materials used, site plan sketch and detailed report etc.) Visit to a construction related exhibition is strongly recommended.

7. Collection of advertisements of modern construction materials and Tools used in construction.

8. Indoor dimension: Height of kitchen platform, bathroom fittings positioning details, furniture details etc.

Note: Collection of local byelaws details from the surrounding areas, Building plan according to byelaws. Carrying a 5m tape is compulsory to all.

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
1 to 5	Building Construction Handbook by R. Chudley, Roger Greeno		Jun 2021
1 to 5	Building Construction Handbook by Sanjeev Mathur		Jun 2021
1 to 5	Practical Handbook on Building Construction by Er. M. K. Gupta		2019
1 to 5	National Building Code of India		Jan 2014
1 to 5	IS-4031, 650, 383, 2387,		

Signature
Cluster G, Shemle.

Signature
(Dr. A.N. Dabhade)
BOS Member

Signature
(Dr. Avinash N Shrikhande,
BOS (Civil Engg) chairman



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem: III (3rd)	Total Hours Distribution per week		
Total Credit: 2	Lecture (L): 2Hrs	Tutorial/Activity (T/A): N.A	Practical (P): N.A
Subject Code	BTCVE306T	EFFECTIVE TECHNICAL COMMUNICATION	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
15 Marks (07 marks for sessional Examination) (08 Marks for Activity based)	35 Marks	23 Marks	2 Hours

Course Objectives	
1	To enhance competency in English language among learners aspiring to be entrepreneurs.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Participate effectively in groups with emphasis on listening and meta cognitive thinking.
2	Prepare memorandum and report.
3.	Deliver an effective oral presentation.
4.	Acquire public speaking skills handling the audience professionally.
5.	Analyze causes of deterioration of concrete components

MAPPING OF CO WITH PO

CO  PO 	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1												
2												
3												
4												
5												

1 Low

2 Medium

3 High

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)
BTCVE306T- EFFECTIVE TECHNICAL
COMMUNICATION
SYLLABUS

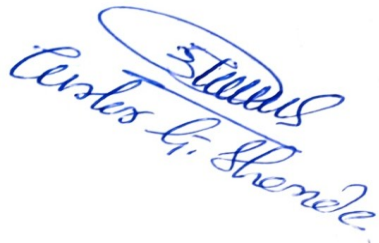
Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 Functional Grammar			
Common errors, Transformation of Sentences, Phrases, Idioms & Proverbs. [50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]	6		
UNIT NO.2 English for Competitive Exams & Interview Techniques			
IPA (vowel & consonant phonemes), Word building (English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment : [25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/Antonyms, 25 words for Analogies, 50 examples of give one word for]	6		
UNIT NO.3 Formal Correspondence			
Business Letters, e-mail etiquettes [Orders, Complaints , Enquiries, Job applications and Resume Writing , Writing Memorandum, Circulars, notices]	6		
UNIT NO.4 Analytical comprehension	4		
Four fictional & four non-fictional unseen texts			
UNIT NO.5 Technical & Scientific Writing			
Features of Technical Writing, Writing Scientific Projects, Technical Report writing, Writing Manuals, Writing Project	6		

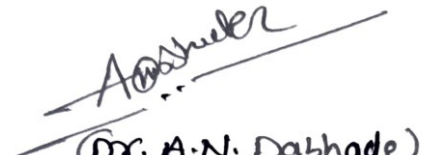
Proposals, Writing Research papers.			
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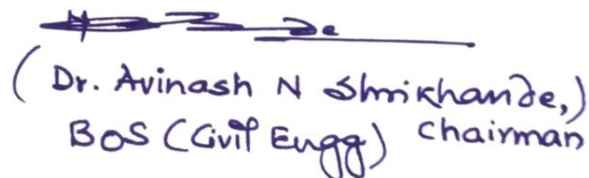
Assignment: (Any one project/review as assignment)

Reference Books:

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. Technical Communication-Principles and Practice by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. The Cambridge Encyclopedia of the English Language by David Crystal , Cambridge University Press
4. Contemporary Business Communication by Scot Ober , Published by Biztantra,
5. BCOM- A South-Asian Perspective by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt.Ltd.2012
6. Business English, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences by Krathwohl & R David
8. Technical Writing- Process and Product by Sharon J. Gerson & Steven M. Gerson, 3rd edition, Pearson Education Asia, 2000
9. Developing Communication skills by Krishna Mohan & Meera Banerjee


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BOS (Civil Engg) chairman

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3Hrs	Tutorial/Activity (T/A): N.A	Practical (P): N.A
Subject Code	BTCVE401T	CONCRETE TECHNOLOGY	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To know different types of cement as per their properties for different field applications, properties of Aggregates and Admixture
2	To know tests on concrete in plastic and hardened stage as well as behaviour of concrete structure
3	To understand Design economic concrete mix proportion for different exposure conditions and Intended purpose.
4	To understand the knowledge of Special Concrete.
5	To understand the various repairing techniques and their material.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Think logically for development Concrete technology application in field of Civil Engineering
2	Gain an experience in the implementation of Concrete Materials on Engineering concepts which are applied on Construction Fields
3.	Understand the process of mix design of concrete.
4.	Differentiate special concrete from conventional concrete.
5.	Analyze causes of deterioration of concrete components

MAPPING OF CO WITH PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C 01	2	3	2	-	-	1	1	1	1	-	-	2
C 02	2	2	2	2	-	1	1	1	1	1	2	2
C 03	3	3	2	2	1	1	1	1	2	1	1	2
C 04	3	3	2	1	-	1	1	-	-	-	-	2
CO5	1	2	2	-	-	-	-	-	-	-	-	2
AVG.	2.2	2.6	2.00	1.00	0.2	0.8	0.8	0.75	1	0.5	0.75	2.00

1 Low
2 Medium
3 High

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)
BTCVE401T- CONCRETE TECHNOLOGY

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1(BASICS AND CONSTITUENTS OF CONCRETE)			
Historical background, composition of concrete, general note on strength mechanism, recent practice and future trends	1		1
Constituent of Concrete : Cement - Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, grades of cement, testing of cement as per Indian standard.	2		1
Aggregates - Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading and grading requirements	2		1
Water - General Requirements & limiting values of impurities	1		1
Admixtures - Additives and admixtures, types, necessity and benefit Mineral admixture - Fly ash, silica fume, blast furnace slag, and other pozzolanic materials. Chemical admixtures - Accelerator, retarder, water reducing elements, plasticizer and super-plasticizer, their functions and dosage	2		1
	8		
UNIT NO.2(FRESH AND HARDENED CONCRETE)			
General: Methods of batching and mixing. Workability –factors affecting workability, measurement tests on workability(Slump cone test, Compaction factor test, Vee-bee consistometer test, flow table test), transporting and placing of concrete, curing of concrete, W/c ratio, Segregation and bleeding, Maturity of Concrete.	3		2
Compressive and tensile strength test, flexural strength and their relationship, factors affecting strength of concrete.	2		2
Introduction to aspects of elasticity, shrinkage and creep. Factors affecting shrinkage and creep, non-destructive tests with their limitations.	2		2
	7		

UNIT NO.3(MIX DESIGN)			
Principles of mix proportioning, probabilistic parameters, factors governing selection of mix.	2		3
Methods of Concrete Mix Design: Variability of test results, acceptance criteria, Road note 4 method(DOE), ACI and IS method of concrete mix design and fly ash based mix Design.	5		3
	7		
UNIT NO.4 (SPECIAL CONCRETE)			
Review of behaviour and characteristics of high strength concrete, high performance concrete, self-compacting Concrete, fibre reinforced concrete, light weight and heavy weight concrete,.	4		4
Pumped concrete, underwater concrete, hot and cold weather concreting, Ready mixed concrete.	3		4
	7		
UNIT NO.5 (REPAIR AND REHABILITATION OF CONCRETE STRUCTURE)			
Distress in structure – causes and precautions, damage assessment of structural elements, repairing techniques and repairing materials.	3		5
Cracks in concrete: Causes, types, prevention, repairs of cracks – materials and methods.	4		5
	7		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1&2	Concrete Technology	M S Shetty;	S.Chand Publication New Delhi		Text Book		
3	Concrete Technology	P Kumar Mehta,	Indian Concrete Institute		Text Book		
4&5	Properties of Concrete	A.M.Neville	Pearson Education		Text Book		
3	Concrete Technology	M L Gambhir;	Tata McGraw Hill		Text Book		
3	Concrete mix design for flyash and superplasticizer	Kishore kaushal	ICI bulletin	Apr - june 1997		Research paper	

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
2	IS 269-2013		2013
	IS 516-1959		1959
2	IS 1786-1985		
4	IS 3812 part 1	Specification of fly ash	
3	IS 10262 - 2009		2009

Applicable for Unit No.	Website address
2	http://www.nptel.iitm.ac.in

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~~_____~~
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RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit: 4	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 1 Hr.	
Subject Code	BTCVE402T	STRUCTURAL ANALYSIS	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To make students understand the determinate and indeterminate structures, their methods of analysis and construction of influence lines.
2	To make students understand the behaviour of beams and frames using Slope Deflection Method and Moment Distribution Method.
3	To make students understand the concept of Influence Line Diagram and analysis of the structural members subjected to Rolling Loads.
4	To make students understand the concept of formulation of Stiffness Matrix, Transformation Matrix, Load Matrix and its application to Beams and Plane Frames.
5	To make students understand the concept of formulation of Stiffness Matrix, Transformation Matrix, Load Matrix and its application to Plane Truss.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply knowledge to analyse determinate and indeterminate structures.
2	Apply knowledge to perform analysis of beams and frames using Slope Deflection Method and Moment Distribution Method.
3	Apply knowledge of Influence Line Diagram to analyse structural members for rolling loads.
4	Apply knowledge of Direct Stiffness Method to analyse Beams and Plane Frames.
5	Apply knowledge of Direct Stiffness Method to formulate Stiffness Matrix, Transformation Matrix, Load Matrix to analyse Plane Truss.

MAPPING OF CO WITH PO

CO/PO ↓ →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO11	PO12
1	3	3	3	3						3		3
2	3	3	3	3						3		3
3	3	3	3	3						3		3
4	3	3	3	3						3		3
5	3	3	3	3						3		3

1 Low

2 Medium

3 High

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FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

BTCVE402T- STRUCTURAL ANALYSIS

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	
UNIT NO.1 (STATICALLY INDETERMINATE STRUCTURES)			
Introduction to Statically indeterminate Structures : Concept of Static indeterminacy.	2	1	1
Analysis of Fixed and Continuous Beams by Three Moments Theorem, effects of Sinking of Support.	6	1	
UNIT NO.2 (ANALYSIS OF BEAMS AND FRAMES)			
Analysis of Continuous Beams & Portal frames by Slope Deflection Method .	4	1	2
Analysis of Continuous Beams & Simple Portal frames (sway and Non Sway) Using Moment Distribution Method.	4	1	
UNIT NO.3 (INFLUENCE LINE DIAGRAM)			
Rolling loads on simply supported beams with concentrated and uniformly distributed loads, maximum B.M. and S.F. Influence Line Diagrams for Reactions, Shear Forces and Bending Moments in simply supported beam, cantilevers and beams with overhangs, ILD for forces in members of Simple Trusses.	6	1	3
UNIT NO.4(MATRIX STIFFNESS METHOD –APPLICATION TO BEAMS AND PLANE FRAMES)			
Basic concept, Degree of Freedom, Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for beam members (without axial deformation), for plane frame members. Member load matrix due to concentrated loads, uniformly distributed loads. Transformation matrix, Assembly of global/ structural load matrix upto three elements. Solution to problems with maximum degree of freedom three.	7	1	4
UNIT NO.5 (STIFFNESS METHOD – APPLICATION TO PLANE TRUSS)			
Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. Transformation matrix, Assembly of global/ Structural stiffness matrix upto (8 x 8). Assembly of global / structural load matrix. Solution to problems with maximum degree of freedom three.	7	1	5

References			
Name of Book	Name of Author	Name of Publisher	Edition
Theory of Structures	S Ramamurtham R. Narayan	Dhanpat Rai & Sons	V edition
Structural Analysis	L S Negi & R S Jangid	Tata McGraw Hill	I
Matrix Analysis of Framed Structures	W Weaver & Gere	CBS publisher	III edition
Theory of Structure	S P Timoshenko	Mc. Graw Hill	
Intermediate Structural Analysis	C.K Wang	Mc. Graw Hill	
Structural Analysis	C.S Reddy	Mc. Graw Hill	
Structural Analysis	R.C. Hibbler		

Dr. Anand S. Shinde
Chairman

Dr. Avinash N. Shrikhande
 BOS (Civil Engg) chairman

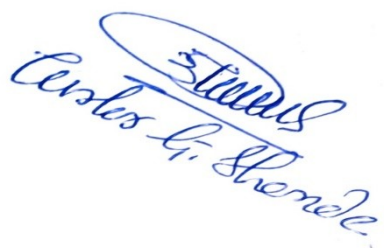
Dr. A.N. Dabhade
 BOS member

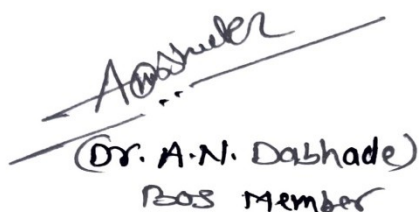
RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

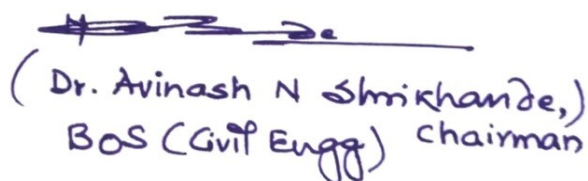
Sem: IV (4th)	Total Hours Distribution per week	
Total Credit: 1	Practical (P): 2 Hrs.	
Subject Code	BTCVE402P	STRUCTURAL ANALYSIS
Examination Scheme		
Internal Marks:	University Marks:	Maximum Passing Marks:
25 Marks	25 Marks	25 Marks

List of Practicals – (Any Six)

1. Verification of Maxwell's reciprocal theorem using simply supported beam.
2. Verification of Maxwell's reciprocal theorem using simply supported truss.
3. Horizontal thrust in two hinged arch.
4. ILD for Horizontal thrust in two hinged arch.
5. Horizontal thrust in three hinged arch.
6. ILD for Horizontal thrust in three hinged arch.
7. Verification of flexural rigidity using simply supported beam.
8. Analysis of a continuous beam using computer software.
9. Analysis of a plane frame using computer software.
10. Analysis of a plane truss using computer software.


Chandar G. Shinde


(Dr. A.N. Dabhade)
BOS Member


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RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): NA	
Subject Code	BTCVE403T	ENVIRONMENTAL ENGINEERING	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	The course will provide students knowledge regarding the sources of water, water demands, population forecasting, characteristics, standards of drinking water
2	To prepare students to analyze, plan and design of various phases of water supply systems and waste water treatment.
3	To provide the students the knowledge regarding the various characteristics of water, waste water estimation of the quantity of water
4	The course will provide students with fundamentals of air pollution and solid waste management, climate change, geo environment and sustainable resource management

Course Outcomes	
After completion of syllabus, students would be able to	
1	Have knowledge of characteristics of water, drinking water standards and necessity of treatment.
2	Design various units of conventional water treatment plant.
3	Understand the characteristics of waste water, necessity of treatment, types of treatment processes
4	Equip with the basic knowledge related to design of waste water treatment
5	Understand of significance of air pollution, solid waste, climate change, geo environment etc

MAPPING OF CO WITH PO

CO  PO 	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3	3						1		3
2	3	3	3	3						1		3
3	3	3	3	3						1		3
4	3	3	3	3	1					1		3
5	3	3	3	3	1					1		3

1 Low

2 Medium

3 High

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

BTCVE403T – ENVIRONMENTAL ENGINEERING

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1			
Introduction: Basics of water supply scheme, Water Demand, population forecasting methods, Sources of water & intake structures.	2		1
Conveyance of water: Types of pipes, joints, fittings, valves & appurtenances.	2		
Water quality: characteristics of water, Standards of drinking water. (WHO 2011, CPHEEO, IS 10500-2016).	2		
Water Treatment: Objective of water treatment, flow sheet of conventional water treatment plant.	1		
Sedimentation: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank.	2		
UNIT NO.2			
Coagulation and Flocculation: Definition, Principles, types of coagulants, coagulant doses, types of mixing and flocculation devices, Clariflocculators.	3		2
Filtration: Mechanism of filtration Types of filters-RSF, SSF, Pressure filters, sand specification, operational problems.Simple design of SSF and RSF, Membrane filtration technique of water treatment.	3		
Disinfection: Purpose, Mechanism, disinfectants, disinfection by chlorination. Type of chlorination.	2		
Distribution systems: Requirements & methods of distribution systems with layouts	1		

UNIT NO.3			
General Introduction: Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Problems on quantity estimation.	3		3
Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.), Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station. Sewer testing and maintenance.	3		
Characteristics: Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant (Problems)	2		
UNIT NO.4			
Preliminary & Primary Treatments: Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatments - Screens, Grit chambers, oil & grease removal, Primary settling tank (Only working principles)	3		4
Secondary treatments - Principle of Biological Treatment, bacterial growth curve, Activated sludge process, trickling filter, sequence batch reactors, oxidation ponds (Only working principles)	2		
Sewage Disposals: Indian Standard for disposal, Methods of disposal, Sewage farming, self-purification of stream (Streeter Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion process, sludge drying beds.	2		
Rural sanitation: Pit privy, aqua privy, bio-gas recovery, Septic tank- soak pit (Only working principles). Sullage collection and disposal	2		
UNIT NO.5			
Introduction of air pollution and municipal solid waste, climate change, geo environment, environmental management system and sustainable resource management.	3		5

References

Name of Book	Name of Author	Name of Publisher	Edition
Water Supply Engineering	B.C.Punmia, Ashok Jain and Arun Jain	Laxmi Publication	
Water Supply & Sewage	M.J.Macghee	McGraw Hill Publication	
Environmental Engineering Vol – I (Water Supply Engineering) and Environmental Engg Vol. II.	Dr P.N. Modi.	Standard Book House	
Environmemtal Engineering	Howards Peavy, Donald R. Rowe and George Tchobanoglous.	McGraw Hill Education	
Central Public Health Environmental Engg. Manual	--	(CPHEEO) New Delhi	
Wastewater Engineering: Treatment and Reuse	Metcalf & Eddy	McGraw Hill Education	
Environmental Engineering-Vol II	S.K.Garg	Standard Publication	
Waste Water Engineering	B.C.Punmia, Ashok Jain and Arun Jain	Laxmi Publication	
Water Supply & Sanitary Engineering	G.S.Birdie	DhanpatRai Publication	

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RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs.		
Subject Code	BTCVE403P	ENVIRONMENTAL ENGINEERING	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments: (Part A, B and C)

A) Any TEN

1. Determination of pH
2. Determination of Conductivity
3. Determination of Turbidity
3. Determination Chlorides
4. Determination of Solid's (Suspended & dissolved)
6. Determination of Acidity and alkalinity
7. Determination of Dissolved Oxygen
8. Determination of Available Chlorine
9. Determination of Residual Chlorine
10. Jar Test(optimum dose of coagulant)
11. Only demonstration of COD, BOD.
12. Bacteriological Plate count and MPN tests

AND

B) Design of Water treatment unit or waste water treatment unit (Any **Two Units** as per CPHEEO manual).

AND

C) Brief Report on visit to water and waste water treatment plant.

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(CHOICE BASED CREDIT SYSTEM)

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): NA	
Subject Code	BTCVE404T	TRANSPORTATION ENGINEERING	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks (15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	The course will provide students knowledge regarding transpiration technologies, administrative set-up in India, development plans and vision 2025.
2	To prepare students to design the cross section elements and the pavement using latest IRC Codes.
3	To provide the students the knowledge regarding the traffic characteristics, road safety audit and introduction to ITS.
4	The course will provide students with fundamentals of Railway Engineering and Airport Engineering.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Define and describe different objectives and requirements of Highway Development and Planning, Alignments.
2	Explain, Discriminate and Design various Geometric Features of Highways & Pavement Design
3	Understand, analyze, apply and evaluate the parameters of Traffic Engineering.
4	Explain and describe various terms in railway engineering and should be able to explain, discriminate and design various geometric features of railway track.
5	Understand the aircraft characteristics and terminal area functions, analyze, and evaluate the basic runway length, orientation of runway.

COs to Unit Mapping Matrix

Course Code	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
CO1	X					
CO2		X				
CO3			X			
CO4				X		
CO5					X	
CO6						X

For Entire Course, PO/PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO

PO1	Engineering Knowledge	PO7	Environment & Sustainability
PO2	Problem Analysis	PO8	Ethics
PO3	Design & Development	PO9	Individual & Team Work
PO 4	Investigation	PO10	Communication Skills
PO5	Modern Tools	PO11	Project Mgt. & Finance
PO6	Engineer & Society	PO12	Life Long Learning

MAPPING OF CO WITH PO

C ↓ PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	1	2	1	1	1	1	-	-	-	1
2	3	2	2	-	-	2	-	1	-	-	-	1
3	3	3	-	2	1	1	-	1	-	-	-	1
4	3	2	2	-	-	2	-	-	-	-	-	1
5	3	1	2	1	-	2	-	-	-	-	-	1

1 Low

2 Medium

3 High

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH - CIVIL ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

BTCVE404T – TRANSPORTATION ENGINEERING

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1			
Introduction Transportation Technologies, Components of Transportation Systems, Transportation Coordination, Transportation Administrative Set-up in India.	2		1
Highway development: Rural Road Development Plan and Vision 2025, Highway Organizations (MoRTH, IRC, CRRI, NHAI, NRRDA, CIRT)	3		
Highway Alignment: Ideal Alignment, Factors controlling alignment, Fact finding survey, Engineering survey for highway location.	3		
UNIT NO.2			
Highway Geometric Design: Cross-Section elements (Boundary lines, right-of way, carriageway width, Shoulder, Camber), surface characteristics, Sight distance Considerations (SSD, OSD,ISD), Design of horizontal Curves including transition, extra widening, Design of vertical curves.	5		2
Pavement Design: Types of Pavements and their comparison, Factors affecting design, Design of Flexible pavement using latest IRC code. Stresses in rigid pavement, joints, Pavement Distresses and remedies	3		
UNIT NO.3			
Traffic Engineering: Traffic characteristics (Road User and Vehicular), Traffic Studies (Speed Volume, O&D, Parking), Traffic Control Devices (Sign, Marking, Signal), Types of Intersections, Parking facilities, Road safety situation in India, Causes of road accidents, Safety of Vulnerable Road users, Introduction to road safety audit Introduction to ITS.	8		3

UNIT NO.4			
Railway Engineering: Permanent Way, ideal permanent way, Gauges in railway tracks,function of rrial, sleeper ballast. Traction and resistances. Cant , negative cant & cant deficiency, Types of turnouts & functions of its components	8		4
UNIT NO.5			
Airport Engineering: Aircraft Characteristics, Airport site selection, Runway Orientation, Basic Runway length and corrections, Terminal Area and facilities. Aircraft parking, configuration and system, Aprons, Hangers, Gate in airport[8]	8		5

References			
Name of Book	Name of Author	Name of Publisher	Edition
Highway Engineering	Khanna, S.K., Justo, C.E.G and Veeraragavan, A	Nem Chand & Bros	10 th (2017)
Traffic Engineering and Transport Planning	Kadiyalai, L.R	Khanna Publishers	
Principles of Transportation Engineering	Partha Chakraborty and Animesh Das	PHI Learning	
Textbook of Highway Engineering	Srinivasa Kumar	Universities Press	2011
Highway Engineering	Paul H. Wright and Karen K. Dixon	Wiley Student Edition	7 th (2009)
'Principles of Highway Engineering and Traffic Analysis	Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski	John Wiley 3, IRC Codes	4 th

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FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs.		
Subject Code	BTCVE404P	TRANSPORTATION ENGINEERING	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

Course Outcomes:

On successful completion of the course students will be able to;

1. Determine the various properties of aggregates
2. Determine the various properties of bitumen
3. Determine the various properties of soil subgrade

List of Experiments: (Part A, B, C and D)

A. Test on Soil

1. CBR Test
2. AASHO Classification
3. Test on Stabilized soil

B. Test on Aggregate

1. Specific Gravity & Water Absorption
2. Crushing Value test on Aggregate
3. Abrasion Value test on Aggregate
4. Impact Value test on Aggregate

C. Test on Bitumen

1. Penetration Test
2. Softening Point Test
3. Ductility Test
4. Specific gravity of bitumen

D. Study experiments

1. Bituminous Mix Design
 2. Road Construction Machineries
 3. Road Safety Audit
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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)

Sem:IV (4th)	Total Hours Distribution per week		
Total Credit:3	Lecture (L): 3Hrs	Tutorial/Activity (T/A): NA	Practical (P): 4Hrs.
Subject Code	BTCVE405T	SURVEYING AND GEOMATICS	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks 15marks for sessional Examination) (15 Marks for Activity based)	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To make the students aware of various surveying instruments, operating principles and their suitability
2	To develop skills of handling instruments, taking measurements and Perform calculations based on the observation
3	Identification of source of errors and rectify them.
4	To prepare the students to plot and also read the various maps.
5	To make the students aware of various surveying instruments, operating principles and their suitability

Course Outcomes	
After completion of syllabus, students would be able to	
1	Measure length and bearing of lines using various instruments and calculate area of given field.
2	Use the theodolite to measure angle and distances for traversing also identify and correct the errors in traverse. Design and lay-out the various types of curves.
3	To carry out levelling and contouring also able to determine volume of earthwork.
4	Use modern instrument like Total work station , GPS, DGPS for surveying and able to prepare maps in CAD
5	Use Remote Sensing and Geographical Information System(GIS), UAV Drone and LiDAR Survey.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code & CO NO.												
CO1	3	2	2	1	1	1	1	2	3	1	1	1
CO2	3	2	3	1	2	1	1	2	3	1	2	1
CO3	3	3	3	1	2	1	1	2	3	2	1	1
CO4	3	3	3	2	3	1	1	2	3	2	2	2
CO5	3	3	3	2	3	1	2	2	3	2	2	2

1 Low

2 Medium

3 High

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)
BTCVE405T- SURVEYING AND GEOMATICS

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT NO.1 (LINEAR AND ANGULAR MEASUREMENT)			
Principal of Surveying, Classification,	01		01
measurement of distance using tape, EDM (Distomat), error and correction in length	02		01
Measurement of area by tape and cross-staff and plane table surveying	02		01
Compass Surveying-Prismatic Compass & Surveyor compass, Bearings, Localattraction, Fieldwork & Plotting	03		01
UNIT NO.2 (THEODOLITE TRAVERSING AND CURVES)			
Uses of theodolite, measurement of horizontal and vertical angle.	2		2
measurement of horizontal and vertical distances(stadia methods)	2		2
errors and corrections in traverse	2		2
Introduction to simple circular curves, Transition curves, vertical curves and Reverse Curve	2		2
UNIT NO.3 (LEVELING AND CONTOURING)			
Levelling , types of levelling, Auto level, temporary adjustments,	1		3
calculation of Reduced level by rise and fall & H.I. method	2		3
correction for curvature and refraction , visible horizon distance,	1		3
Contours: Definition, characteristics, uses, locating and plotting of contour map.	2		3
Computation of area and volume: Trapezoidal and Simpsons Rule	2		3

UNIT NO.4(MODERN SURVEYING)			
Total station-advantages and Applications.	1		4
Field Procedure for total station survey,	1		4
Errors in Total Station Survey and preparation of Contours and site plan in CAD	2		4
Introduction to GPS and DGPS (Differential Global Positioning System) Principle and Applications for Static and Real Time Kinematic (RTK)Survey	4		4
UNIT NO.5 (REMOTE SENSING AND GIS)			
Introduction to Remote Sensing and Geographical Information System (GIS) and itsapplications	4		5
Introduction to UAV Drone and LiDARSurvey and applications.	4		5

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
I, II, III	SurveyingandLevelling	KanetkarandKulkarni	Vidhatigrihan Prakashan	2008			
I,II,III,IV	Surveying (Vol-I)	Dr. B.C. Punmia, A.K.Jain	Laxmi Publications (P)Ltd.	2016	Y		
III	Surveying (Vol-II)	Dr. B.C. Punmia, A.K.Jain	Laxmi Publications (P)Ltd.	2016	Y		
I,II,III,IV	Surveying and Levelling	N.N.Basak	Tata McGraw-Hill education (P) Ltd	2001	Y		
IV,V	Advance Surveying, Total Station, GIS and Remote Sensing	SatheeshGopi &R.Sathikumar & N.Madhu	Pearson Education	2008	Y		

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NAGPUR FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)**

Sem: IV (4th)	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs.		
Subject Code	BTCVE405P	SURVEYING AND GEOMATICS	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments

A. Any 15

1. Determination of area of given polygon by tape and cross staff survey.
2. Measurement of area of plot by plane table surveying.
3. Determination of elevation of various points with Auto level.
4. Levelling – Longitudinal and cross-section and plotting
5. Measurement of Horizontal angle by using theodolite
6. Measurement of vertical angle and Trigonometric leveling using theodolite
7. Determination of Tacheometric constants.
8. Determination of elevation of points, horizontal distance and gradient by Tacheometric survey
9. Setting out of simple circular curve by offsets from chord produced method
10. Setting out of simple circular curve by Rankine method of tangential angle
11. Determination of height, remote elevation, distance between 2-3 points using total station
12. Determination of Area using total station.
13. Determination of Area using DGPS.
14. CONTOUR MAP: contouring using DGPS.
15. Toposheet: Understanding and identification of different features of drawing.
16. Lay-out marking of building plan
17. Study of EDM, GPS, Digital Planimeter.

B. Four days Survey Camp on any ONE using advanced survey instruments

1. Contouring
 2. RoadSurvey
 3. Lay outing , Location of Boundary and areacalculation
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B. TECH. CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)**

Sem: IVth	Total Hours Distribution per week		
Total Credit: 1	Lecture (L): 2 Hrs	Tutorial/Activity(T/A): NA	Practical (P): 2Hrs.
Subject Code	BTCVE406P	MINI PROJECT	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

Course Objectives	
1	To achieve and promote skill development and technology transfer.

List of Course Outcome	
1	After completion of syllabus student able to propose research/ basic concepts question and present them in a clear and distinct manner through different oral, written, analysis and design techniques.

Marks distribution of Internal Marks

Sr. No.	Name of activity	Expected work	Allotted marks(maximum)
1	Seminar-1	Title Finalization & Approval of topic	10 marks
2	Students Diary	Detailed report of student interaction with guide weekly and duly signed and evaluated by concern guide/co-guide	5 marks
3	Seminar-2	Pre submission of Mini project	10 marks
Total			25 marks

For seminar conduction kindly refer point no.6 of below guidelines

Marks distribution of External Marks

Sr. No.	Name of activity	Expected work	Allotted marks(maximum)
1	Presentation	Student wise presentation on the basis of submitted reports	10 marks
2	Viva Voce	Student wise at the time of presentation or after completion of presentation.	15 marks
Total			25 marks

For seminar conduction kindly refer point no.7 of below guidelines

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**B. TECH. CIVIL ENGINEERING
(CHOICE-BASED CREDIT SYSTEM)
BTCVE4O6P- MINI PROJECT**

SYLLABUS

Project allotment and identification should be done at the end of 3rd semester. Following guidelines may be used for the mini-project allotment and evaluation.

Guidelines:

The knowledge and concepts related to Engineering acquired by the students in four years of the course has to be implemented in the form of some practical work. Hence in the second year of the course, every student has to do a mini project work by applying the acquired concepts and knowledge. Therefore at the entry of fourth semester, the student initiates mini-project work with a defined group. Industry-oriented project should be preferred.

1. The institute will care the research and topic interest of each student and it offers flexibility to the student for formation of groups according to their choice of particular interest. However it is advised them to follow limitation of group members (four to five students per group). The list of guides along with their specialization should be provided at the end of third semester. Every teacher can be guide and co-guide. Institute can take Industry person /Government Organization member such as PWD, irrigation department's person as a Co -guide.

2. The group of students will approach to the guide for the consent and submit the application to the project coordinator of the department at the end of third semester.

OR

The group of students will submit the application to the department at the end of third semester with preferences of guides as per their specialization and previous semester's university scored marks.

3. Project Coordinator should prepare the merit list of the project groups as per the policy of the Institute.

4. In the due course of time, students will carry out a literature review about their area of interest and identify the scope of work by deciding the topic in consultation with the guide. The mini projects should be industry oriented; application, product, research, review, etc. title of mini project should be basis on the feasibility study of the project.

5. The project may have analytical approach in respective discipline area or

interdisciplinary domain.

6. Progress seminars are conducted wherein the students will present their progress of the work before the project review committee. The committee will evaluate their work with respect to the following rubrics:

- A. Understanding the background and topic/Content of the progress report or seminar
- B. Knowledge about existing system/Literature Review
- C. Technical design and findings of the system/technical content
- D. Presentation skills
- E. Viva voce (Individual/Group)

7. Contents of Presentation/reports at the time of external examinations (may be used for Internal Examinations also) will as below:

- A. Index
- B. Introduction
- C. Literature review
- D. Objective
- E. Working model/analysis/design details
- F. Conclusion
- G. References

The parameters mentioned above are for general guidelines; however, they may vary from department to department. The departments should ensure that the evaluation is done at individual and group levels.

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