RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: THIRD

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
			L	T/A	P	L	T/A	P	Total	Theory		Practical		Total	Theory	Practical
										Int	Uni	Int	Uni			
1	BTCVE301T	Mathematics-III	3	1	0	3	1	0	4	30	70	--	--	100	45	--
2	BTCVE302T	Fluid Mechanics	3	0	0	3	0	0	3	30	70	--	--	100	45	--
3	BTCVE302P	Fluid Mechanics (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
4	BTCVE303T	Solid Mechanics	3	1	0	3	1	0	4	30	70	--	--	100	45	--
5	BTCVE303P	Solid Mechanics (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
6	BTCVE304T	Geotechnical Engineering	3	0	0	3	0	0	3	30	70	--	--	100	45	--
7	BTCVE304P	Geotechnical Engineering (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
8	BTCVE305T	Building Construction & Elementary Building Drawing	2	0	0	2	0	0	2	30	70	--	--	100	45	--
9	BTCVE305P	Building Construction & Elementary Building Drawing (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
10	BTCVE306T	Effective Technical Communication	2	0	0	2	0	0	2	15	35	--	--	50	23	--
Total			16	2	8	16	2	4	22	165	385	100	100	750		

- L- Lecture , P-Practical, T- Tutorial , A- Activity (Half Credit per Hour)

(Dr. A.N. Dabhade) BOS Member

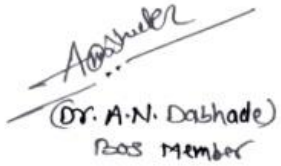
(Dr. Avinash N Shrikhande,) BOS (Civil Engg) Chairman

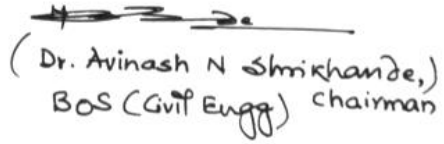
RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: FOURTH

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
			L	T/ A	P	L	T	P	Total	Theory		Practical		Total	Theory	Practical
										Int	Uni	Int	Uni			
1	BTCVE401T	Concrete Technology	3	0	0	3	0	0	3	30	70	--	--	100	45	--
2	BTCVE402T	Structural Analysis	3	1	0	3	1	0	4	30	70	--	--	100	45	--
3	BTCVE402P	Structural Analysis (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
4	BTCVE403T	Environmental Engineering	3	0	0	3	0	0	3	30	70	--	--	100	45	--
5	BTCVE403P	Environmental Engineering(Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
6	BTCVE404T	Transportation Engineering	3	0	0	3	0	0	3	30	70	--	--	100	45	--
7	BTCVE404P	Transportation Engineering (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
8	BTCVE405T	Surveying &Geomatics	3	0	0	3	0	0	3	30	70	--	--	100	45	--
9	BTCVE405P	Surveying &Geomatics (Practical)	0	0	4	0	0	2	2	--	--	25	25	50	--	25
10	BTCVE406P	Mini Project (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
TOTAL			15	1	12	15	1	6	22	150	350	125	125	750		

- L- Lecture , P-Practical, T- Tutorial , A- Activity (Half Credit per Hour)

Note: In Summer vacation after 4th Semester, students have to complete 2 to 3 weeks industrial / Government / NGO / MSME / Rural Internship / Innovation / Entrepreneurship training. In the beginning of 5th semester, students have to submit detailed report of summer vacation training to department.





RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: FIFTH

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
			L	T/ A	P	L	T	P	Total	Theory		Practical		Total	Theory	Practical
										Int	Uni	Int	Uni			
1	BTCVE501T	Hydraulic Engineering	3	0	0	3	0	0	3	30	70	--	--	100	45	--
2	BTCVE501P	Hydraulic Engineering (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
3	BTCVE502T	Reinforced Cement Concrete (RCC) designs	3	1	0	3	1	0	4	30	70	--	--	100	45	--
4	BTCVE503T	Civil Engineering Materials, Testing & Evaluation	3	0	0	3	0	0	3	30	70	--	--	100	45	--
5	BTCVE503P	Civil Engineering Materials, Testing & Evaluation (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
6	BTCVE504T	Professional Practice, Law & Ethics	3	0	0	3	0	0	3	30	70	--	--	100	45	--
7	BTCVE505T	Elective-I	3	0	0	3	0	0	3	30	70	--	--	100	45	--
8	BTCVE506T	Elective-II	3	0	0	3	0	0	3	30	70	--	--	100	45	--
9	BTCVE507P	Industrial Training (Already done in summer vacation after 4th sem) & Professional Skill Training (Software Applications in Civil Engineering)	0	0	2	0	0	1	1	--	--	50	50	100	--	50
10	BTCVE508AU	Organizational Behavior	2	0	0	0	0	0	0	--	--	50	Audit	50	--	--
TOTAL			20	1	6	18	1	3	22	180	420	150	100	850		

- L- Lecture , P-Practical, T- Tutorial , A- Activity (Half Credit per Hour)

(Dr. A.N. Dabhade) BOS Member

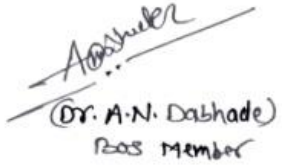
(Dr. Avinash N Shrikhande,) BOS (Civil Engg) Chairman

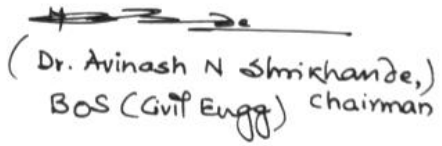
RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: SIXTH

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
										Theory		Practical		Total	Theory	Practical
			L	T/A	P	L	T	P	Total	Int	Uni	Int	Uni			
1	BTCVE601T	Estimating & Costing	3	1	0	3	1	0	4	30	70	--	--	100	45	--
2	BTCVE601P	Estimating & Costing (Practical)	0	0	2	0	0	1	1	--	--	25	25	50	--	25
3	BTCVE602T	Construction Engineering & Management	2	1	0	2	1	0	3	30	70	--	--	100	45	--
4	BTCVE603T	Water Resource Engineering	3	0	0	3	0	0	3	30	70	--	--	100	45	--
5	BTCVE604T	Elective-III	3	0	0	3	0	0	3	30	70	--	--	100	45	--
6	BTCVE605T	Open Elective-I	3	0	0	3	0	0	3	30	70	--	--	100	45	--
7	BTCVE606P	Computer Aided Civil Engineering Drawing (Practical)	0	0	2	0	0	1	1	--	--	50	50	100	--	50
TOTAL			14	2	4	14	2	2	18	150	350	75	75	650	--	--

- L- Lecture , P-Practical, T- Tutorial , A- Activity (Half Credit per Hour)

Note: In summer vacation after 6th Semester, student have to complete 3 to 4 weeks industrial / Government / NGO / MSME / Rural Internship / Innovation / Entrepreneurship training. In the beginning of 7th semester, student have to submit detailed report of summer vacation training to department.





RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: SEVENTH

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
			L	T/A	P	L	T	P	Total	Theory		Practical		Total	Theory	Practical
										Int	Uni	Int	Uni			
1	BTCVE701T	Design of Steel Structure	3	1	0	3	1	0	4	30	70	--	--	100	45	--
2	BTCVE702T	Elective IV	3	0	0	3	0	0	3	30	70	--	--	100	45	--
3	BTCVE703T	Elective V	3	0	0	3	0	0	3	30	70	--	--	100	45	--
4	BTCVE704T	Elective VI	3	0	0	3	0	0	3	30	70	--	--	100	45	--
5	BTCVE705T	Open Elective-II	3	0	0	3	0	0	3	30	70	--	--	100	45	--
6	BTCVE706P	Project Work Phase-I	0	0	6	0	0	3	3	--	--	50	50	100	--	50
Total			15	1	6	15	1	3	19	150	350	50	50	600		

- L- Lecture , P-Practical, T- Tutorial , A- Activity (Half Credit per Hour)

Note:

1. Project Work Phase-I shall consist of detailed report of **"Internship report"** of 3 to 4 weeks underwent after 6th semester and **"SeminarReport"** shall consist of Topic selected for Project work
2. Equal weightage shall be given to the components of **"Internship Report" and "Seminar Report"**

(Dr. A.N. Dabhade) BOS Member

(Dr. Avinash N Shirkhande,) BOS (Civil Engg) Chairman

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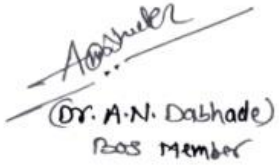
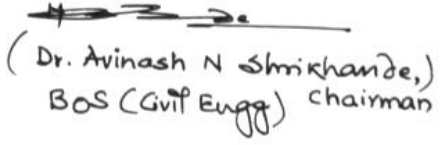
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: EIGHTH

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
			L	T/ A	P	L	T	P	Total	Theory		Practical		Total	Theory	Practical
										Int	Uni	Int	Uni			
1	BTCVE801T	Construction Methods And Equipment Management #	3	0	0	3	0	0	**3**	30	70	--	--	**100**	**45**	**--**
2	BTCVE802T	Digital Land Surveying And Mapping (DLS&M) #	3	0	0	3	0	0	**3**	30	70	--	--	**100**	**45**	**--**
3	BTCVE803T	Open Elective-III	3	0	0	3	0	0	**3**	30	70	--	--	**100**	**45**	**--**
4	BTCVE804P	Project Work Phase-II	0	0	12	0	0	6	**6**	--	--	100	100	**200**	--	**100**
TOTAL			**9**	**0**	**12**	**9**	**0**	**6**	**15**	**90**	**210**	**100**	**100**	**500**		

Note:

1. These # subjects **(BTCVE801T and BTCVE802T)** should be undertaken through online mode by using NPTEL/SWAYAM /MOOCS Platforms **OR** through regular classroom teaching in Department of Civil Engineering of affiliated Colleges. Examinations will be conducted by RTMNU.
2. Project Work Phase-II shall consist of detailed report of continued project work from 7th Semester or internship in industry or at appropriate work place.





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 enrichlogical 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/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)

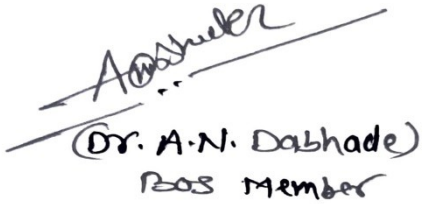
BTCVE301T - APPLIED MATHEMATICS-III

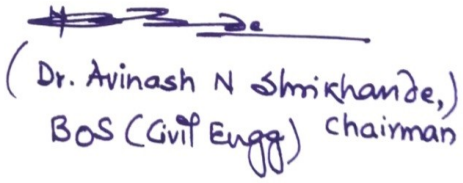
SYLLABUS

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	40th
Advanced Engineering Mathematics	Erwin Kreysizig	Wiley India	8th
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	





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: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

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY,
NAGPUR FACULTY OF SCIENCE & TECHNOLOGY

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)			
1. **Fluid Mechanics and its importance** in Civil Engineering, Rheological diagram and itssignificance. 2. **Fluid Properties**: Basic Properties, Viscosity and its Significance, Surface Tension, Capillarity, Compressibility, Vapour Pressure. 3. **Pressure and its measurement**: Pressure at a point and its representation, atmospheric and gauge pressure, Pressure measurement by manometer, information about mechanical and digitalpressure gauges.			
UNIT NO.2			
1.**Hydrostatics**: Total Pressure and centre of pressureon for a plane surface and curved surface immersed in fluid. Numerical Problems. 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. 3. **Fluid masses** subjected to relative equilibrium, effect of horizontal and vertical acceleration on the moving fluid masses.			
UNIT NO.3			
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. **2. Kinetics of Flow:**Forces acting on a fluid mass, Euler's Equation of motion, Bernoulli's Equation.			

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) ForOpen Channel- Notches and weirs, velocity of approach, End contraction, Sharp crested,broad crested weir and Labriynth 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	21st (2017)
A Text Book of Fluid Mechanics and Hydraulic Machines	R.K. Bansal	Laxmi Publications (P) Ltd., New Delhi	9th (2005)
A Text Book of Fluid Mechanics and Hydraulic Machines	R.K. Rajput	S Chand & Company (P) Ltd., New Delhi	6th (2015)
Fluid Mechanics including Hydraulic Machines	A.K. Jain	Khanna Publishers	(2006)
Hydraulics, Fluid Mechanics and Fluid Machines	S. Ramamrutham	DhanpatRai Publishing Co., New Delhi	9th (2011)

Dr. A.N. Dabhade)
BOS Member

(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 :1	**Practical (P): 2 Hrs.**		
Subject Code	**BTCVE302P**	**FLUID MECHANICS**	
Examination Scheme - Practical			
Internal Marks:	**University Marks:**	**MinimumPassing 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

(Dr. A.N. Dabhade)
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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	**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**

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH - CIVIL ENGINEERING

(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	**5th**
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	

Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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FACULTY OF SCIENCE & TECHNOLOGY

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	**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

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

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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FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING

(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	Edition	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

Course Co-ordinator

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
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 : 1	**Practical (P): 2 Hrs.**		
Subject Code	**BTCVE304P**	**GEOTECHNICAL ENGINEERING**	
Examination Scheme - Practical			
Internal Marks:	**University Marks:**	**MinimumPassing 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.

(Dr. A.N. Dabhade)
BOS Member

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

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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): 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**

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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

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

(Dr. A.N. Dabhade)
BOS Member

(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 : 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,		

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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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 ResumeWriting ,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. 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 UniversityPress, 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 andBehavioral Sciences by Krathwohl & R David
8. Technical Writing- Process and Product by Sharon J. Gerson & Steven M. Gerson, 3rd edition, PearsonEducation Asia, 2000
9. Developing Communication skills by Krishna Mohan & Meera Banerjee

(Dr. A.N. Dabhade)
BOS Member

(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: 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

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
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: 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**

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

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. A.N. Dabhade)
BOS Member

(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: 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.

(Dr. A.N. Dabhade)
BOS Member

(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: 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

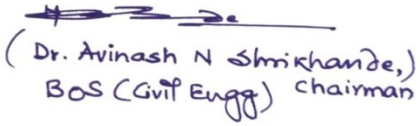
RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. TECH - CIVIL ENGINEERING
(CHOICE BASED CREDIT SYSTEM)
BTCVE403T – ENVIRONMENTAL ENGINEERING

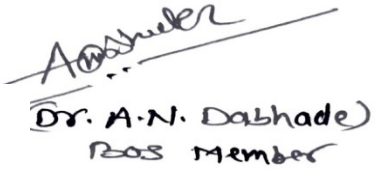
SYLLABUS

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, CPHEOO, 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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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:**	**MinimumPassing Marks:**	**Examination Duration:**
25 Marks	**25 Marks**	**25 Marks**	**--**

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

A) Any TEN

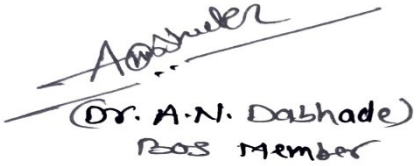
1. Determination of pH
2. Determination of Conductivity
3. Determination of Turbidity
3. Determination Chlorides
4. Determination of Solid's (Suspended & dissolved)
6. Determination of Acidity and alkalinity
7. Determination of Dissolved Oxygen
8. Determination of Available Chlorine
9. Determination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

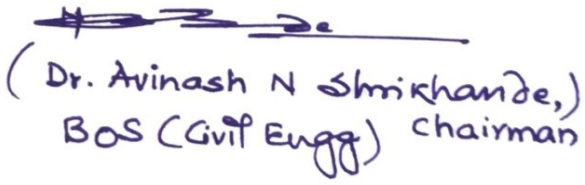
AND

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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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	**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 rial, 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	10th (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	7th (2009)
'Principles of Highway Engineering and Traffic Analysis	Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski	John Wiley 3, IRC Codes	4th

Dr. A.N. Dabhade
BOS Member

(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: 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

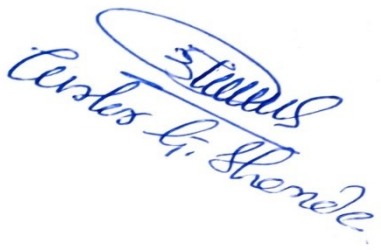
1. Specific Gravity & Water Absorption
2. Crushing Value test on Aggregate
3. Abrasion Value test on Aggregate
4. Impact Value test on Aggregate

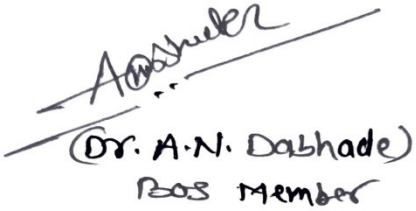
C. Test on Bitumen

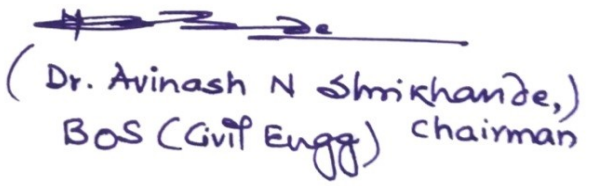
1. Penetration Test
2. Softening Point Test
3. Ductility Test
4. Specific gravity of bitumen

D. Study experiments

1. Bituminous Mix Design
2. Road Construction Machineries
3. Road Safety Audit







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): 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 theirsuitability
2	To develop skills of handling instruments, taking measurements and Performcalculations based on theobservation
3	Identification of source of errors and rectifythem.
4	To prepare the students to plot and also read the variousmaps.
5	To make the students aware of various surveying instruments, operating principles and theirsuitability

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 2Medium 3 High

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

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		

(Dr. A.N. Dabhade)
BOS Member

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

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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:**	**MinimumPassing Marks:**	**Examination Duration:**
25 Marks	**25 Marks**	**25 Marks**	**--**

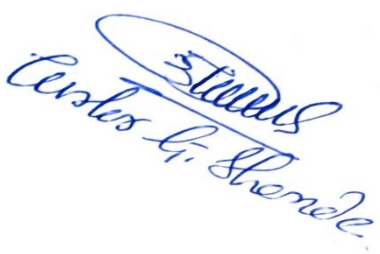
List of Experiments

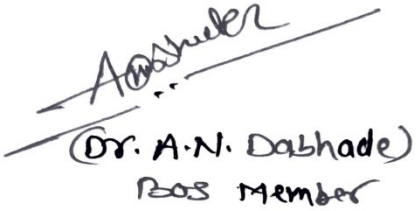
A. Any 15

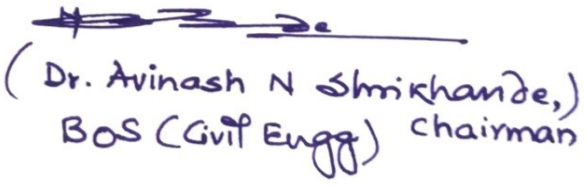
1. Determination of area of given polygon by tape and cross staffsurvey.
2. Measurement of area of plot by plane table surveying.
3. DeterminationofelevationofvariouspointswithAuto level.
4. Levelling – Longitudinal and cross-section andplotting
5. Measurement of Horizontalangle by usingtheodolite
6. Measurement of vertical angle and Trigonometric leveling usingtheodolite
7. Determination of Tacheometric constants.
8. Determination of elevation of points, horizontal distance and gradient by Tacheometricsurvey
9. Setting out of simple circular curve by offsets from chord producedmethod
10. Setting out of simple circular curve by Rankine method of tangentialangle
11. Determination of height, remote elevation, distance between 2-3 points using totalstation
12. Determination of Area using totalstation.
13. Determination of Area using DGPS.
14. CONTOUR MAP: contouring using DGPS.
15. Toposheet: Understanding and identification of different features ofdrawing.
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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NAGPUR FACULTY OF SCIENCE & TECHNOLOGY

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 (IndividuaUgroup)

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.

(Dr. A.N. Dabhade)
BOS Member

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

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

Sem:V	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE501T**	**Name of Subject: Hydraulics 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 Objective	
1	To know the boundary layer theory and concept of drag and lift
2	To understand the various losses occurring in pipe flow, various phenomenon occurring in this case
3	To compute uniform flow through open channel and understand the concept of specific energy
4	To analyse the gradual varied flow and hydraulic jump concept
5	To understand the design principle of various hydraulic machines likes turbines and pumps

Course Outcome	
After completion of syllabus student able to	
1	Understand the concepts related to boundary layer theory and determination of drag and lift forces
2	Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and to discuss effects of water hammer pressures.
3	Use the concepts of uniform and critical flow through open channels, design of efficient channel sections and application of specific energy concept.
4	Understand gradually varied flow analysis and its computation, and its application in open channel flow.
5	Understand and apply basics principles related to turbines & Pumps in water Resources planning

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO
BECVE501T CO1	3	3	3			2						
BECVE501T CO2	3	3	3		2	2						
BECVE501T CO3	3	3	3		2	2						
BECVE501T CO4	3	3	3	3	2	2						
BECVE501T CO5	3	3	3	3	2	2	1	1				

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Real Fluid Flow:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Viscous Flow: Reynold's experiment, viscous flow through a circular pipe, velocity and shear stress distribution, Hazen poisuillee equation	**02**		**1**
Boundary layer concept: Nominal thickness, displacement thickness, momentumthickness of the boundary layer: Boundary layer along a thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sub-layer: separation of boundary layer on plane and curved surfaces.	**03**		**1**
Real, Incompressible Fluid Flow Around Immersed Bodies: General definition of drag and lift; flowpast plates, cylinders and spheres; drag on sphere; drag on sphere, cylinder and flat plate	**03**		**1**
	08		
Unit No.2			
Flow through Pipes:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Hydraulically smooth and rough pipes: Frictional resistance to flow of fluid in smooth and rough pipes; Moody's chart; Darcy-Weisbach & Hazen-William's equation for frictional head loss; Hydraulic gradient	**07**		**2**

and energy gradient: Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy-Cross methods of pipe networks; Water-hammer, pressure head due to sudden closure of valve.			
	07		
Unit No.3			
Uniform Flow Through Open Channels	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
(A) General: Types of channel and their geometrical properties; Types of flow in open channel.	**03**		**3**
(B) Uniform Flow: Chezy's and Manning's equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal depth of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.	**03**		**3**
(C) Critical Flow: Specific energy and its diagram; alternate depths; Computations of critical depth, section factor for critical flow, critical slope; normal, critical slope, Specific force and its diagram; Conditions of critical flow.	**02**		**3**
	08		
Unit No.4			
Non Uniform Flow through Open Channel	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
(A) Gradually Varied Flow: Dynamic equation for GVF; Classification and characteristics of surface profiles; direct Step method of computing profile length.	**02**		**4**
(B) Rapidly Varied Flow: Definition of hydraulic jump; Equation of hydraulic jump in horizontal, rectangular channel; Length & height of jump; Energy loss in jump classifications of jump	**03**		**4**

Concept of Impact of Jet			
Force exerted on stationary and moving plate and curved surface, concept of velocity triangles	**02**		**4**
	07		
Unit No.5			
Fluid Machinery	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
(A) Turbines: Definition: Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.	**02**		**5**
(B) Reciprocating Pumps: Components parts, working principle, Work done of single & double acting pumps; Negative slip, Air vessels-Working principle and necessity, indicator diagram	**02**		**5**
(C) Centrifugal Pump: Component parts; working principle; Static and manometric heads; different efficiencies; Priming & priming devices, Specific speed; Theoretical aspects of multistage pumps; Trouble & remedies; operating characteristics curves.	**03**		**5**
	07		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1 and 5	Fluid Mechanics and Hydraulic Machines	P.N.Modi and S.M. Seth	Standard Book House Delhi	**21st 2017**	**Yes**		
All	Fluid Mechanics	A.K.Jain	Khanna Publishers Nai Sarak New Delhi.	**9th 2006**	**Yes**		

2 to 5	Fluid Mechanics	R.K.Rajput	S.Chand & Company Pvt(L), New Delhi	**6th 2015**	**Yes**		
	Hydraulics, Fluid Mechanics and Hydraulic Machine	S.Ramamrutham	Dhanpat Rai Publishing Co., New Delhi	**6th 1998**	**Yes**		
	Flow in open channels	K. Subramanya	Tata McGraw Hills Publishing Company Ltd, New Delhi	**2nd 1997**			**Yes**

(Dr. A.N. Dabhade)
BOS Member

(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:V	**Two Hours Distribution per week**		
Total Credit: 1	**Practical (P): 02 Hrs.**		
Subject Code	**BTCVE501(P)**	**Name of Subject: Hydraulics Engineering(P)**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
25 Marks	**25 Marks**	**25 Marks**	

List of Experiments- (Minimum 8 experiments should be performed)

1. Determination of Frictional factor of a pipe line
2. Determination of minor losses through a pipe system
3. Determination of critical slope of an open channel
4. Study on Main characteristics of a centrifugal pump
5. Study on operating characteristics of a reciprocating pump
6. Study on operating characteristics of a centrifugal pump
7. Study on main characteristics of reciprocating pump
8. Analysis of Hydraulic jump in open channel
9. Determination of coefficient of impact of jet
10. Study of characteristics of a Pelton wheel
11. Study of characteristics of a Francis Turbine
12. Study of Reynolds's experiment
13. Determination Chesy's and Manning constants
14. Analysis of a Water Distribution network by Hardy cross method

(Dr. A.N. Dabhade)
BOS Member

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

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

Sem: V	**Total Hours Distribution per week 3-1-0**		
Total Credit:04	**Lecture (L):03 Hrs**	**Tutorial/Activity (T/A): 01 Hrs.**	**Practical (P): 00 Hrs.**
Subject Code	**BTCVE502T**	**Name of Subject: Reinforced Cement Concrete Designs**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**4 Hr**

Course Objective	
1	To understand phenomenon's of design concepts and learning various codes related to RCC design.
2	To understand the structural behavior of steel and concrete.
3	To apply conventional methods for design structural components of building.

Course Outcome	
After completion of syllabus student able to	
1	Understand the fundamental concepts of working stress method as per IS 456- 2000 and Pre-stressed concrete method.
2	Apply the fundamental concepts of limit state method on limit state of serviceability
3	Analyze the fundamental concepts of limit state of collapse in flexure, Shear & Bond as per IS 456-2000.
4	Evaluate the fundamental concepts of limit state of collapse in compression and design of footing as per IS 456-2000.
5	Design of Simply supported Two-way slab

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to the Working Stress Method of RCC design. Basic concept in design for flexure, assumptions, design constants. Analysis of the rectangular section. (Balanced, under–reinforced and over– reinforced sections). **Introduction to Prestress Concrete:** Properties of high grade materials, concepts of prestress concrete, method of pre-stressing, losses in pre- stressing. Various systems for pre-stressing with particular reference to Freyssinet, Magnel Blatton and Giffod Udall system	**07**		1
	07		
Unit No.2			
Introduction to Limit State Design: Concept of limit state design and philosophy. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse. Limit states of durability **Limit State of serviceability**: **Causes and control of cracking**: Crack in plastic concrete at early	**10**		**2**

age, cracks due to temperature and shrinkage, restrain induced cracks, cracks due to loading. Needs for crack width control. Moment– curvature relationship, deflection control of beams and one way slabs. Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Limit state of Collapse in Flexure: Analysis & design of the Tee & L- beam section. Limit state of Collapse in Shear & Bond: Design of beam for shear , shear span, post cracking resistance, shear mechanism approach , shear failure modes and collapse loads, interaction of shear , flexure and axial force ,Check for bond.			
	10		
Unit No.3			
Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uni-axial bending, use of interaction curves.	**08**		**3**
	08		
Unit No.4			
Design of one –way, simply supported, single span and cantilever slabs and continuous slab / beam with IS coefficients,	**07**		**4**
	07		
Unit No.5			
Design of rectangular pad / slopped footing for axial load. Design of Simply supported Two-way slab	**04**		**5**
	04		

Text Books	1.	P.C.Varghese, Limit State design of Reinforced Concrete, 2nd Edition, PHI Learning Pvt Ltd, 2006
	2.	M.L.Gambhir, Design of Reinforced Concrete, 4th Edition, PHI Learning Pvt Ltd, 2011
	3.	M.L.Gambhir, Fundamental of Reinforced Concrete Design, 5th Edition, PHI Learning Pvt Ltd, 2011
EBooks	1.	Design of Reinforced Masonry Structures, Second Edition, Narendra Taly, Ph.D., P.E., F.ASCE
	2.	Building Design and Construction Handbook, Sixth Edition,Frederick S. Merritt

Reference Books	1.	Dr. V.L.Shah & Dr. S.R.Karve, Limit State Theory and Design of Reinforced Concrete (As Per IS : 456 - 2000), 7th Edition, Structures Publications, 2013
	2.	"Illustrated Reinforced Concrete Design" by Dr. V.L.Shah and Dr. S.R. Karve, 'Structures Publications' , Pune 411009
online TL Material	1.	Design of Reinforced Concrete Structures, Civil Engineering, Prof. N. Dhang, IIT Kharagpur

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
ALL	**IS 456 PLAIN AND REINFORCED CONCRETE - CODE OF PRACTICE (Fourth Revision)**		2000

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): NA**	**Practical (P): 2 Hrs.**
Subject Code	**BTCVE 503T**	**Name of Subject: Civil Engineering Materials, Testing and Evaluation**	

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 Objective	
1	The properties and importance of various constituent materials of concrete used in construction
2	The mechanical behaviour of engineering materials under compressive and tensile loads
3	The fundamentals of fracture mechanics and identify initiation and propagation of crack around stress-strain fields.
4	The standard testing procedures and assess engineering properties of construction materials.
5	The main goal of this course is to provide students with all information concerning principle, way of measurement, as well as practical application of mechanical characteristics.

Course Outcome	
After completion of syllabus student able to	
1.	Evaluate the role of materials in Civil Engineering
2.	Know the mechanical behaviour and properties of steel and concrete by standard testing procedures for identifying their performance
3.	Explain special materials, composite materials and use of new techniques in constructions for satisfying the future needs of industry.
4.	Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice
5.	Evaluate and write a technical laboratory report.

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Introduction To Civil Engineering Materials			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction and uses of cement, sand, aggregates	**01**		**1**
concrete, mortar and grouts, masonry mortars, rendering, cementations grouts	**02**		**1**
RCC, clay bricks, calcium silicate bricks, concrete blocks., rubbles, steel, mechanical properties of steel, different applications	**02**		**1**
Floor and roofing tiles, slates, timber, strength of timber, engineered wood products metals, glass for glazing, glass fibres, glass wool	**02**		**1**
Water proofing agents: any five water proofing agents, difference between wetting agents and water proof agent	**01**		**1**
	08		
Unit No.2 Basic Properties of Materials			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Importance of materials in civil engineering construction, types of materials such as ceramics, concrete, composites, optical /electronics materials, glass, metals, nano-materials, polymers and plastics, wood and other materials, comparison of strengths of various materials.	**04**		**2**
Some basic properties of materials such as temperature, energy, specific heat, thermal conductivity, coefficient of thermal expansion,	**03**		**2**

comparison for environmental impact, health and safety.			
	07		

Unit No.3 Special Materials

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Composite Materials: RCC, FRC, AAC (Autoclaved aerated concrete) blocks, WPC (Wood-plastic composites) Material, Cera sheets, 3D wall WPC panels, polymer based materials, steel/concrete composite bridge decks, fibre reinforced plastics structural insulated panels.	**03**		**3**
New Techniques in Constructions-Introduction, 3D printing, photo catalytic admixture, self-healing concrete, Biomaterials, zero cement concrete ,hemp lime, wood-glass epoxy composites, bamboo.	**04**		**3**
	07		

Unit No.4 Testing Procedures of Materials

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Material Testing, Machines and Equipment Requirements---Necessity of material testing, various testing methods, destructive tests, classification of destructive tests---static, impact and cyclic testing,non-destructive testing- its classification ,visual inspection, penetration test, ultrasonic test.	**03**		**4**
Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.	**04**		**4**
	07		

Unit No.5 Testing and Evaluation Procedures of Materials

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion,	**04**		**5**
Code of practice and guidelines in this regards for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic materials; Timbers; Glass and Plastics; Structural Steel.	**03**		**5**
	07		

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2	'Building Construction Handbook	Chudley, R., Greeno (2006),	R. Butterworth-Heinemann	(6th ed.)	√		
4	Mechanical Testing of Engineering Materials,	Kyriakos Komvopoulos (2011),	Cognella				√
1,2,4	' Highway Materials and Pavement Testing'	Khanna, S.K., Justo, C.E.G and Veeraragavan	Nem Chand & Bros,	Fifth Edition	√		
1,2,3	Mechanical Behaviour of Materials	E.N. Dowling (1993)	Prentice Hall, International Edition				√
1-5	Building Materials,Testing, and Sustainability	N. Subramania	Publisher: Oxford University Press, New Delhi				√
1-5	Related papers published in international journals					√	

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
	IS: 456 – code of practice for plain and reinforced concrete.		2000/2016
	IS: 2386 – methods of tests for aggregate for concrete.		1963
	10262; SP 23 – codes for designing concrete mixes.		2009/2019
	IS: 13311 – ultrasonic testing of concrete structures.		1992

	IS:1199 - Fresh Concrete – Tests		2018
	IS:3495 - Burnt Clay Bricks Tests		1992/2016
	IS:1786 –High strength deformed steel bars and wires for concrete reinforcement— specification		2008
	IS:2062 - Hot rolled medium and high tensile structural steel — specification		2011
	IS:1608 - Metallic Materials — Tensile Testing (Part 1-3)		2005/2018
	IS:1599 - Methods for bend test		2012
	American Society for Testing and Materials (ASTM),	Annual Book of ASTM Standards	(post 2000)
	BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering application		

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

CIVIL ENGINEERING MATERIALS, TESTING AND EVALUATION

BTCVE503P **Evaluation Scheme: (25-Internal/25-External)**

(P-2 Hrs/Week); Total Credits- 01

Minimum Eight Practical's from the given below list should be performed

Sr. No.	Details of Topic
1	**Tests on cement (Any Two)** Field test on cement, Fineness, Normal consistency, Initial and Final Setting times, Specific gravity, Soundness, Compressive strength,
2	**Tests on fine aggregate (Any Two)** Grain size distribution, Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Bulking & Absorption
3	**Tests on coarse aggregate (Any Two)** Grain size distribution, Uniformity coefficient and fineness modulus, Specific gravity, Density, Void ratio, Absorption
4	**Concrete mix Design**
5	**Test on concrete by using IS code method (Any Two)** (a) Workability test, Slump test, Compaction factor test, Flow table test, Vee-Bee Consist meter, (b) Compressive strength, Split tensile strength, Flexure test on beams, Modulus of elasticity
6	Tests on bricks Crushing strength, water absorption and efflorescence
7	Tensile and Compressive strength of materials & concrete composites
8	Tests on polymers and polymer-based materials
9	Testing on Ceramic Floor, Wall Tiles, Paver-blocks, Mosaic tiles, IS code recommendations.
10	Study of non-destructive testing of concrete (NDT)
11	Field density of bituminous roads

A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE504T**	**Name of Subject: Professional Practice, Law & Ethics**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	The objective of this course is to inculcate the sense of social responsibility among learners and to make them realize the significance of ethics in professional environment so as to make them a global citizen

Course Outcome	
After completion of syllabus student able to	
1	Understand basic purpose of profession, professional ethics and various moral and social issues.
2	Analyse various moral issues and theories of moral development
3	Realize their roles of applying ethical principles at various professional levels
4	Identify their responsibilities for safety and risk benefit analysis.
5	understand their constructive roles in dealing various global issues

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE504T1						2	2	3				1
BECVE504T2						2	2	3				1
BECVE504T3						2	2	3				1
BECVE504T4						2	2	3				1
BECVE504T5						2	2	3				1

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Human Values, Morals, values and Ethics, Integrity, Work ethics, Service learning, Civic virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage	**08**		**1**
Unit No.2			
Engineering Ethics, Senses of 'Engineering Ethics', Variety of moral issues, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory	**07**		**2**
Unit No.3			
Engineering as Social Experimentation, Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law(Industrial Disputes Act, 1947; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017)	**07**		**3**
Unit No.4			
Safety, Responsibilities and rights, Safety and Risk, Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk, Collective Bargaining, Professional Rights, Employee Rights	**07**		**4**

Unit No.5			
Global issues, Multinational Corporations, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Corporate Social Responsibility	**07**		**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, IV,V	Professional Ethics	R. Subramaniam	Oxford Publications, New Delhi.				Yes
	Human Values And Professional Ethics by,	Jayshree Suresh and B. S. Raghavan	S. Chand Publications				Yes
	Ethics in Engineering by–	Mike W. Martin and Roland Schinzinger	Tata McGraw-Hill – 2003.				Yes
	Human Values & Professional Ethics by,	S. B. Gogate	Vikas Publishing House Pvt. Ltd., Noida.				Yes
	Professional Ethics and Human Values	A. Alavudeen, R.Kalil Rahman, and M. Jayakumaran	University Science Press.				Yes
	Engineering Ethics & Human Values	M.Govindarajan, S.Natarajan, and V.S.SenthilKumar	PHI Learning Pvt. Ltd – 2009.				Yes

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	**Total Hours Distribution per week**		
Total Credit: 01	**Lecture (L): 00 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 02 Hrs.**
Subject Code	**BTCVE507P**	**Name of Subject: Industrial Training & Professional Skill Training**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
50 Marks	**50 Marks**	**50 Marks**	**--**

Course Objective	
1	The objective of the course is to give awareness of practical application of various theoretical concepts.
2	The objective of the course is to enhanced the skills by using software in the field of Civil Engineering

Course Outcome	
After completion of syllabus student able to	
1	Understand organizational skills & professional practices
2	Interpret the communication skills of organizational members with each other
3	Analyze the structural problems by using STADD.PRO
4	Design the structural members by using STADD.PRO

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE507P1					3				2	2		1
BECVE507P2					3				2	2		1
BECVE507P3					3				2	2		1
BECVE507P4					3				2	2		1

1 Low 2 Medium 3 High

SYLLABUS

Part A: Industrial Training

(25 Marks Internal and 25 Marks External)

After successful completion of industrial training of 2 to 3 weeks, students have to give Industry training report including certificate of completion of industrial training.

Part B: Professional Skill Training on STADD.PRO/Any Other

(25 Marks Internal and 25 Marks External)

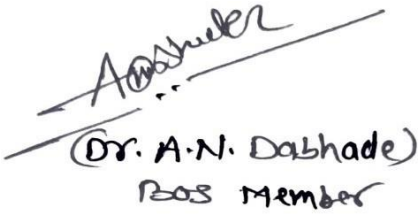
STAAD PRO is structural analysis and designing software which is used by civil engineers to analyse and design the structure. It helps to reduce the calculations of Shear Force, Bending Moment and deflection of structure.

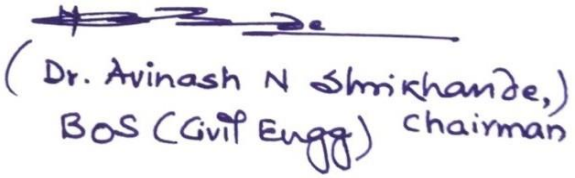
1. Practical Based on: Overview of Structural Analysis and Design, Introduction of STAAD. Pro V8i, STAAD Editor, Creating a New Project in STAAD.Pro, Units, Model Generation, Creating Nodes & Members, Select Menu, Insert Node, Add Beam, Modeling Methods, Long and Short Method Practice, Modeling Practice, Working On Examples.
2. Practical Based on: Support Specification, Member Property Specification, And Material Specification. Loading, Analyzing. Understanding Units, Working on examples, Understanding Material Properties, Understanding Various Types of Loads, and Implementing Loads.
3. Practical Based on : Performing Analysis, Pre Analysis Print, Post Analysis Print, Area Load, Floor Load.
4. Practical Based on: Wind Load Generation, Load Combination & Auto Load Combinations, Repeat Load Cases, Concrete Design.

5. Practical Based on : Concrete Column Design, Concrete Beam Design, Slab Design.

Student have to submit maximum four experiments on above contents (Selection of contents made by concern faculty) in 8 weeks.

Proposed amendment is "STAD Pro V8i or Any Other Equivalent Software may also be used for performing the same activities.





RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: V	**Total Hours Distribution per week**		
Total Credit: 00	**Lecture (L): 02 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE508AU**	**Name of Subject: Organizational Behaviour**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
50 Marks	**AUDIT**	**--**	**--**

Course Objective	
1	The objective of the course is to create awareness among learners about the various essential aspects of organizational processes and structure and motivation in organization.

Course Outcome	
After completion of syllabus student able to	
1	Understand the concept and importance of organizational behaviour.
2	Acquire the knowledge of interpersonal behaviour and transaction analysis
3	Know different traits and theories of personality
4	Analyze the importance of motivation in organization and types of leadership

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE508AU1									3	2		1
BECVE508AU2									3	2		1
BECVE508AU3									3	2		1
BECVE508AU4									3	2		1

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1: Introduction to organizational behaviour			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Concept of organization behavior	**01**		**1**
Importance of organization behaviour	**02**		**1**
Key elements of organization behaviour	**01**		**1**
Scope of organizational behaviour.	**02**		**1**
	06		
Unit No.2: Introduction to interpersonal behavior			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Nature and meaning of interpersonal behaviour	**01**		**2**
Concept of transaction analysis	**02**		**2**
Benefits and uses of transaction analysis	**01**		**2**
Johari window model.	**02**		**2**
	06		
Unit No.3: Introduction to personality			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Definition and meaning of personality	**02**		**3**
Importance of personality	**02**		**3**
Theories of personality, personality traits.	**02**		**3**
	06		

Unit No.4 : Introduction to Motivation and leadership			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Concept and importance of motivation	**01**		**4**
Maslow's two factor theory of motivation.	**02**		**4**
Significance of motivation in organization.	**01**		**4**
Types of leadership styles	**02**		**4**
	06		

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,IV	Organizational behaviour	MN Mishra					
	The human side of organization	Michale Drafke					
	Management and Organizational behaviour	Laurie.J. Mullins					
	Organizational behaviour	K. Aaswathappa					

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week: 3-0-0**		
Total Credit:3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A):0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE505T**	**Name of Subject: Elective – I (Advanced Structural Analysis)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objectives	
1	To provide the knowledge about strain energy methods
2	To provide the knowledge about buckling of columns and analysis of arches
3	To analyse multi-storeyed frame structures using approximate methods
4	To develop an understanding, the basic principles of the matrix method of structural analysis
5	To analyse non-prismatic structures (beams and frames) using column analogy method
6	To introduce finite element method and provide knowledge of structural dynamics

Course Outcomes	
After completion of syllabus students will be able to	
1	Compute deflections in two dimensional structures using Strain energy method
2	Understand response of long columns
3	Use the approximate method for analysis of multi-storied frame structures
4	Understand Flexibility matrix method and application of column analogy
5	Understand the concepts related to structural dynamics & finite element method

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code &CO NO.												
BECVE505T.1	3	3	3	3	3	-	-	-	-	-	-	2
BECVE505T.2	3	3	2	3	3	-	-	-	-	-	-	1
BECVE505T.3	3	3	3	3	3	-	-	-	-	-	-	1
BECVE505T.4	3	3	3	3	1	-	-	-	-	-	-	2
BECVE505T.5	3	3	2	2	3	-	-	-	-	-	-	2

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1:			
Details of Topic:	**Allotment of Hours**		**Mapped with CO Number**
	L	T/A	CO
Strain energy method as applied to the analysis of redundant frames and redundant truss up to two Degrees, Determination of deflection of trusses. Castigliano's theorems. Maxwells reciprocal theorem. Bettis theorem.	**7**		**1**
	7		
Unit No.2			
Bucking of columns: Euler's and Rankine's formula, Secant Formula Analysis of Two-Hinged Arches S.F. and normal thrust, parabolic arches.	**5**		**2**
	5		
Unit No.3			
Approximate method: Analysis of multi-stored frame, portal, cantilever and substitute frame methods. (max. three bay three storey).	**7**		**3**
	7		
Unit No.4			
Introduction to Flexibility Method up to two DOF. Analysis of Grid Member using Stiffness Method Column Analogy Method – Application to fixed beams, Stiffness and carryover factor	**9**		**4**
	9		

Unit No.5			
Introduction to structural dynamics, D' Alembert Principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, MDOF (up to 3 DOF), Mode shape and nodal frequency. Introduction to Finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for bar elements (prismatic/non-prismatic) Displacement based bar elements (prismatic/non- prismatic)	**8**		**5**
	8		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
All	Theory of Structures	Timoshenko S. P.&Young D.H.	McGraw Hill 1965	International Edition	-	-	√
All	Theory and Analysis of Structures; Vol. I & II",	Jain, O.P. & Arya, A.S.	Nemchand Brothers, Roorkee		√	-	-
	Matrix Analysis	Wear & Gear					

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture : 3 Hours**	**Tutorial//Activity(T/A):N.A**	**Practical(P): N.A**
Subject Code	**BTCVE505T**	**Subject:- Geo Synthetics Engineering (Elective-I)**	

Examination Scheme			
Internal Marks-	**University Marks**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5 Marks for sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3Hours**

Course Objective	
1	To determine the properties, functions and applications of various geosynthetic materials.
2	To impart knowledge about manufacturing methods.
3	Introduce to the students, Mechanism, improvement of Bearing capacity.
4	To impart knowledge about applications and functions of geosynthetics.
5	To design reinforced soil structures.

Course Outcome	
After completion of syllabus student able to	
1	To understand types of geosynthetics and its techniques to use properly in suitable construction site.
2	Understand the different functions of Geosynthetics .
3	Understand the applications of geosynthetics in Civil engineering field.
4	Study and identify about various reinforced soil structures.
5	Understand reinforced soil embankments.

MAPPING OF CO WITH PO

CO/ P0	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C 01	3	2	2	2	--	2	2	1	--	--	2	2
C 02	3	2	1	2	1	--	2	1	--	1	--	2
C 03	3	--	2	2	1	2	--	1	--	2	--	2
C 04	3	--	1	1	1	2	2	1	--	2	--	2
C 05	3	2	2	2	2	--	--	1	--	--	2	2
AVG.	**3**	**2**	**1.67**	**1.83**	**1.4**	**2**	**2**	**1**	**--**	**1.67**	**2**	**2**

1Low 2Medium 3High

SYLLABUS

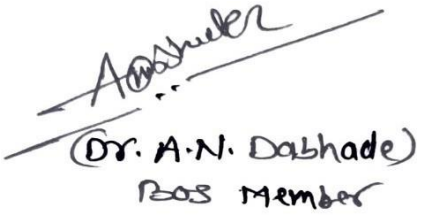
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**co**
UNIT NO.1 Properties and Laboratory Testing of Geosynthetics			
Geotextiles: Basic properties and its determination.	**01**		**1**
Determination of Hydraulic properties, Mechanical properties and its determination – Results of the tests Geotextile Interface friction evaluation –Modified Direct Shear Test, pull out test, Results of the test Survivability Characteristics – puncture test, CBR Push through test, Tear test, Diaphragm bursting Test, Cone drop	**03**		**1**
Test Durability Characteristics – Abrasion resistance Geogrid: Mechanical properties-Tension test, Geogrid-soil interaction, Geogrid Interface friction evaluation –Modified Direct Shear Test, pull out test. Range of values of important properties,	**03**		**1**
Functional Requirements of Geosynthetics, Minimum Values specified by regulatory authorities IS Code provisions	**01**		**1**
	08		
UNIT NO.2 Erosion Control and Pavement Construction			
Erosion control products, Mechanism of erosion control with reinforced vegetation, Installation of REPs on slopes, Functions of coir Geotextile, Geotextile silt fences for sediment control, silt fence installation	**03**		**2**
: Functions of Geotextile in Pavement, Advantages, U.S. forest Service Design method, Construction procedure	**03**		**2**
	06		

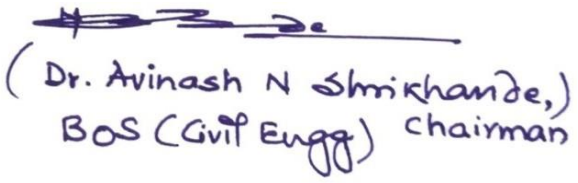
UNIT NO.3 Filtration and drainage applications & Bearing capacity improvement			
Geotextile filter mechanism, Filter criteria, Geotextile survivability, Installation of Geotextile under riprap slope protection, Geotextile chimney drains	**03**		**3**
Reinforced soil bed, Mechanism, Modes offailure (Binquet and Lee theory), Results of Experimental Investigations for optimizing the parameters of reinforced soil bed, Bearing capacity ratio and its variation with various parameters	**04**		**3**
	07		
UNIT NO.4 Reinforced retaining walls			
Applications, Advantages, Types, Components of reinforced soil wall, Types of facing units, Construction sequence of Geotextile reinforced wall and Geogrid soil wall,	**04**		**4**
Failure mechanism and Analysis of reinforced retaining wall Design of Geotextile reinforced retaining wall – General consideration, Design procedure	**03**		**4**
	07		
UNIT NO.5 Reinforced soil embankments			
Applications, Advantages	**02**		**5**
Containment systems using Geomembrane: advantages of using composite barrier for Liners and Covers, Single composite liner system for MSW landfill, Double composite liner system for HW landfil	**06**		**5**
	08		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2,3	Engineering with Geosynthetics	G.V.Rao and G.V.S.S Raju	Tata-McGraw Hill Publication, New Delhi	2004	**Text Book**	-	-
1,2,3,	Ground Improvement Techniques, P	Purushothams Raj	University Science Press, 1 st Ed.	2011			
1,2,3,4,5	Geosynthetics.	J. N. Mandal,	World, New Age International Publishers Pvt. Ltd., I st Ed.,	2007			
1,2,3,4,5	Construction and Geotechnical Engineering using Synthetic Fabrics,.	R.M. Koerner and J.P. Welsh,	John Willey and Sons,	1980			
1,2,3	Designing with Geosynthetics	R.M. Koerner, 4th edition, PHI, 1997	PHI	1997			
1,2,3	Fundamentals of Geosynthetic Engineering	Sanjay Kumar Shukla and Jian-Hua Yin,	,Taylor and Francis Group UK,	2002			
4	Reinforced Soil and its Engineering Applications,	Swami Saran, 1st edition	I. K. Internationals	2006			

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
1	Indian Standard GLOSSARY OF TERMSFOR GEOSYNTHETICS PART 1 TERMS USED IN MATERIALS AND PROPERTIES	Indian Standard	Februar y 1992
2	Indian Standard GEOTEXTILES - METHODS OF TEST PART 5 DETERMINATION OF TENSILE PROPERTIES USING A WIDE WIDTH STRIP	Indian Standard	Feb rua ry 199 2





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

Sem: V	**Total Hours Distribution per week**		
Total Credit:03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 3 Hrs.**	**Practical (P): Nil Hrs.**
Subject Code	**BTCVE505T**	**Name of Subject: Geo Environmental Engineering (Elective-I)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To create a awareness in the field of Geo-Environmental Engineering.
2	To impart the knowledge on Geotechnical aspects in the disposal of waste materials and the remediation of contaminated sites.
3	To familiarise design of landfill and know the effect of change in environment on soil properties.
4	Explain the effects of pollutants in soil properties.

Course Outcome	
After completion of syllabus student able to	
1	Deal with geo-environmental engineering problems
2	Utilize waste in Geotechnical applications
3	Design Landfill & Mange leachate and landfill gas
4	Do investigation on contaminated site and soil remediation
5	Assess variation in engineering properties of soil due to change in environment

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction and Soil-water-environment interaction :	**01**		**1**
Introduction to geo-environmental Engineering,	**01**		
Soil-water-environment interaction relating to geotechnical problems,	**01**		
Waste:-source, classification and management of waste,	**01**		
Physical, chemical and geotechnical characterization of municipal solid waste,	**01**		
Impact of waste dump and its remediation	**01**		
	06		

Unit No.2			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Geotechnical application of waste and disposal:	**01**		**2**
Geotechnical use of different types such as Thermal power plant waste,	**01**		
Municipal Solid Waste, mine waste,	**01**		
Industrial waste.	**01**		
Waste disposal facilities,	**01**		

Parameters controlling the selection of site for sanitary and industrial landfill.	**01**		
Site characterization. MoEF guidelines.	**01**		
	07		

Unit No.3

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Landfill Components:Landfill layout and capacity, components of landfill and its functions.	**01**		**3**
Types and functions of liner and cover systems,.	**01**		
Compacted clay liner, selection of soil for liner, methodology of construction	**02**		
Leachate, Gas Management and Geosynthetics: Management of Leachate and gas.	**02**		
Various components of leachate collection and removal system and its design. gas disposal/utilization. Closure and post closure monitoring system,	**01**		
Geosynthetics- Geo membranes - geosynthetics clay liners -testing and design aspects.	**02**		
	09		

Unit No.4

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Soil remediation: Investigation of contaminated soil, sampling, assessment.	**02**		**4**
Transport of contaminants in saturated soil	**01**		
Remediation of contaminated soil- in-situ / exit remediation, bio remediation,	**01**		
thermal remediation, pump and treat method,	**01**		
phyto remediation and electro-kinetic remediation	**01**		
	06		

Unit No.5

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Variation in Engineering properties of soil	**02**		**5**
atterberg limit, shear strength,	**01**		
Permeability and swelling due to change in environment/pore fluid.	**02**		
	05		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1	Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies,	Hari D. Sharma, Krishna R. Reddy	John Wiley & Sons Inc.	**2004**			
2	Geoenvironmental Engineering: Principles and Applications	Reddi L.N and Inyang HI	Marcel Dekker Inc Publication	**2000**			
3	Geoenvironmental Engineering: Contaminated Soils, Pollutant Fate	R. N. Yong,	Mitigation Lewis Publication	**2000**			
4	Waste Disposal in Engineered landfills	Manoj Datta	Narosa Publishing House	**1997**			

(Dr. A.N. Dabhade)
BOS Member

(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: V	**Total HoursDistribution per week**		
Total Credit: 3	**Lecture : 3 Hours**	**Tutorial//Activity(T/A): 0 Hrs**	**Practical(P): 0 Hrs**
Subject Code	**BTCVE505T**	**Subject: Advanced Building Materials (Elective-I)**	

Examination Scheme			
Internal Marks-	**University**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5marks. for sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hrs**

Course Objectives	
This course will enable students to	
1	Understand composition and microstructure of various materials used in civil engineering application.
2	Understand the manufacturing and types of mortars.
3	Understand engineering behavior of various materials.
4	Understand the use of advanced materials in construction projects.
5	Understand the sustainable materials used in construction.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the structural, physical and long term performance of building materials used in construction.
2	Understand special mortars and admixtures used in Civil engineering applications.
3	Understand the properties of Ceramic materials in construction projects.
4	Understand the uses of polymeric materials in construction.
5	Understand green building concept and materials.

MAPPING OF CO WITH PO

CO/ P0	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C 01	2	2	2	2	1	-	-	-	1	1	2	2
C 02	2	2	2	2	1	-	-	-	1	2	2	2
C 03	2	2	2	1	1	-	-	-	1	1	2	2
C 04	2	2	2	1	1	-	-	-	1	2	2	2
CO5	2	2	2	1	1	-	-	-	1	1	2	2
AVG.	2	2	2	1.4	1	-	-	-	1	1.4	2	2

1Low 2Medium 3High

SYLLABUS

Details of Topic	**Allotment of Hours**		**Mapped with CONumber**
	L	**T/A**	**co**
UNIT NO.1(CONSTRUCTION MATERIALS)			
a) Classifications of Construction Materials.	**01**		**1**
b) Consideration of physical, Mechanical, thermo-physical Properties, Characteristics behaviour under stress.	**03**		**1**
c) Selection criteria for construction materials, waste products, reuse and recycling.	**03**		**1**
	07		
UNIT NO.2(MATERIALS FOR MAKING MORTAR AND CONCRETE)			
a)Lime manufacture, properties, hardening of lime, types of lime, lime concrete uses, cement, aggregates, water, characteristics, properties and uses of Pozzolana materials	**03**		**2**
b) Types of mortars, special mortars, properties and applications, admixtures	**03**		**2**
	06		

UNIT NO.3 (CERAMIC MATERIALS)			
a)Classification, Refractories, glass, glass wool.	**02**		**3**
b) Mechanical, thermal and electrical properties	**03**		**3**
c)Fire resistance materials, Uses and application.	**03**		**3**
	08		
UNIT NO.4 (POLYMERIC MATERIALS AND STEEL)			
a) Polymerization mechanism and depolymerisation.	**02**		**4**
b)Rubber and plastics, properties, effect of temperature on mechanical properties. Uses and application.	**03**		**4**
c) Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel.	**02**		**4**
	07		
UNIT NO.5 (SUSTAINABLE MATERIALS)			
a)Green concepts in buildings, Green building materials ,Green building ratings IGBC and LEED manuals – mandatory requirements.	**04**		**5**
b)Rainwater harvesting &solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions.	**03**		**5**
	07		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1&2	Engineering Materials	Rangwala S.C.	Chortor Publication	1991	**TextBook**		

3&4	Building Material	S.K Duggal	New Age International Publication	2006	**Textbook**		
5	The ideas of green building	A.K.Jain	Khanna publisher		**Textbook**		
2&3	Building Materials Technology Structural Performance & Environmental Impact	Bruntley L.R	McGraw Hill Inc	1995	**Textbook**		

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs.**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE505T**	**Name of Subject: Ground Water Hydrology (Elective-I)**	

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 Objective	
1	To equip the students with capabilities required to explain groundwater occurrences, aquifer classification and aquifer properties in the many different geological environments.
2	Carrying out comprehensive hydrological flow systems analysis in groundwater systems.
3	Performing detailed groundwater balances, interpreting and working with the concepts of groundwater recharge, storage, and discharge.
4	Knowledge of the steady-state and transient groundwater flow processes and their physical description.
5	Application of analytical solutions to solve the groundwater management problems.

Course Outcome	
After completion of syllabus student able to	
1	Define groundwater and its occurrences, classify the aquifers and illustrate aquifer properties
2	Analyse the comprehensive hydrological flow systems in groundwater systems
3	Perform detailed groundwater balances, interpreting and working with the concepts of groundwater recharge, storage, and discharge
4	Interpret the steady-state and transient groundwater flow processes and their physical description
5	Solve the groundwater management problems

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P
BECVE505T CO1		3										2
BECVE505T CO2		3	3	1								2
BECVE505T CO3		2	3	1								2
BECVE505T CO4		3	2									2
BECVE505T CO5		2	1									2

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Details of Topic Introduction:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Ground water utilization & historical background, Role of groundwater in the hydrologic cycle, problems and perspectives, groundwater resources status in India, ground water budget.	**02**		**1**
Occurrence and movement of groundwater, Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation	**02**		**1**
Aquifers and their characteristics/classification, groundwater basins & springs,	**02**		**1**
Darcy's Law, permeability & its determination, Dupuit's equation with assumptions, heterogeneity &anisotropy,	**02**		**1**
	08		
Unit No.2			
Details of Topic: Well Hydraulics:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Types of wells, methods of construction, tube well design, dug wells, pumps for lifting water, working principles, power requirement,	**01**		**2**
Steady Flow, Radial flow in confined and unconfined aquifers, pumping test	**02**		**2**
Unsteady Flow, General equation, derivation; thesis method, Cooper and Jacob method, Chow's method	**02**		**2**
Leaky aquifers (only introduction), interference of well, image well theory.	**02**		**2**
	07		

Unit No.3			
Details of Topic: Surface and Subsurface investigations of Groundwater:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Geologic methods, remote sensing, geophysical exploration,	**01**		**3**
Electrical resistivity and seismic refraction, logging techniques, test drilling & ground water level measurement	**02**		**3**
ARTIFICIAL GROUND WATER RECHARGE: Concept & methods of artificial ground water recharge,	**02**		**3**
Recharge mounds & induced recharge, wastewater recharge for reuse, water spreading.	**01**		**3**
	06		
Unit No.4			
Details of Topic: POLLUTION AND QUALITY ANALYSIS OF GROUND WATER	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Municipal /industrial /agricultural /miscellaneous sources & causes of pollution,	**02**		**4**
Attenuation/ underground distribution / potential evaluation of pollution, physical /chemical /biological analysis of ground water quality, criteria & measures of ground water quality,	**03**		**4**
Ground water salinity & samples, graphical representations of ground water quality.	**03**		**4**
Ground Water Development: Conjunctive use, necessity, techniques and economics.	**02**		**4**
	10		
Unit No.5			
Details of Topic : Modelling and Management of Groundwater:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Ground water modelling through porous media /analog / electric analog / digital computer models,	**03**		**5**
Ground water basin management concept, hydrologic equilibrium equation, ground water basin investigations	**02**		**5**
Data collection & field work, dynamic equilibrium in natural aquifers, management potential & safe yield of aquifers, stream-aquifer interaction.	**03**		**5**
	08		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1	Ground Water	H.M. Raghunath	Wiley Eastern Publication, New Delhi		**Yes**		
2 to 5	Ground Water Hydrology	K. Todd	Wiley and Sons, New Delhi.		**Yes**		
2 to 5	Ground Water Hydrology	Bower. H.	McGraw Hill, New Delhi				**Tes**

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs**	**Practical (P) : 0 Hrs**
Subject Code:	**BTCVE505T**	**Name of Subject: Advanced Surveying (Elective-I)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To impart knowledge of Advanced surveying methods.
2	Develop skill to use advance surveying instruments and analyse data
3	Understand different errors and elimination of errors
4	To make aware of the use of modern surveying instruments for real life problems.

Course Outcome	
After completion of syllabus student able to	
1.	Understand Remote Sensing, terms involved in Remote Sensing and its applications.
2.	Apply drone and LiDAR technology for surveying
3.	Process digital images and interpret images using different tools.
4.	Understand Geographical concepts and terminology involved in GIS and its Applications.
5.	Handle GPS and DGPS for surveying

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Remote Sensing			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction and definition of remote sensing terms,remote sensing system, principles of remote sensing,	**02**		**1**
Interaction of EMR, Fundamentals of aerial photography, platforms and orbits,	**02**		**1**
Sensors,data products, principles of visual interpretation, principles and uses;	**02**		**1**
Thermal remote sensitize, microwave remote sensing.	**02**		**1**
	08		
Unit No.2 UAV Drone & LiDAR			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Types of Drone and its applications	**01**		**2**
LiDAR Techniques and its types	**02**		**2**
Application of Drone Technology for large area mapping	**02**		**2**
Generation of 3D data from Drone/LiDAR and preparation of DSM,DTM and detailed contour maps	**03**		**2**
	08		

Unit No.3 : Image Interpretation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Principles of interpretation of aerial and satellite images,	**02**		**3**
Equipments and aids required for interpretation,	**02**		**3**
Ground truth collection and verification,advantages of multi date and multi band images,	**02**		**3**
Digital image processing; introduction, image enhancementtechniques, digital image classification.	**02**		**3**
	08		
Unit No.4 Geographic Information System (GIS)			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Geographic Information System (GIS)- Definition of GIS,Geographical concepts and terminology	**02**		**4**
Components of GIS, Data acquisition, Raster and vector formats, scanners and digitizers.	**03**		**4**
Advantages of GPS and GIS in the storage of the matic information extracted from remotely sensed image	**03**		**4**
	08		
Unit No.5 Global Positioning System (GPS) & Differential GPS			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to navigation and positioning Geodesy;	**01**		**5**
Geospatial reference systems, overview of GPS;	**01**		**5**
DGPS Techniques Post Process Kinematic and Real Time Kinematic technique.	**02**		**5**
DGPS Triangulation and closing techniques	**02**		**5**
Advance DGPS applications	**02**		**5**
	08		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
I	Remote Sensing and Geographical Information Systems	M. Anji Reddy			**Y**		
I,III, IV, V	**Advanced Surveying**: Total Station, GPS,	GopiSatheesh, R.Sathikumar, N Madhu	Pearson	2017	**Y**		

	GIS & Remote Sensing						
II	Fundamentals of Capturing and Processing Drone Imagery and Data	Amy E Frazier, Kumar K Singh	**CRC Press**				**Y**
IV	Concepts and techniques of Geographic Information Systems.	- C.P LO Albert KW Yeung,	Pritince Hall of India	Edition 2002	**Y**		

(Dr. A.N. Dabhade)
BOS Member

(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: V	**Total Hours Distribution per week 3-0-0**		
Total Credit: 03	**Lecture (L): 03 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE506T**	**Name of Subject: Advanced Concrete Structure (Elective-II)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**04 Hours**

Course Objective	
1	To understand the design concepts and learning various codes related to advanced reinforced concrete structure.
2	To understand the structural behavior of steel and concrete.
3	To apply conventional methods for design structural components of building.

Course Outcome	
After completion of syllabus student able to	
1	Understand the behaviour and failure modes of different RC structural members
2	Analyze and apply the results in designing various RC structural members.
3	Apply the knowledge and skills in practical problems
4	Understand the relevant software and use the same in the analysis and design of RC members.

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	3	-	-	-	-	-	-	2	-	3
CO2	3	3	3	-	-	-	-	-	-	2	-	3
CO3	3	3	3	-	-	-	-	-	-	2	-	3
CO4	3	3	3	-	-	-	-	-	-	2	-	3
Avg CO	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**

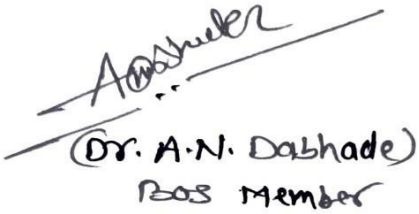
1 Low 2 Medium 3 High

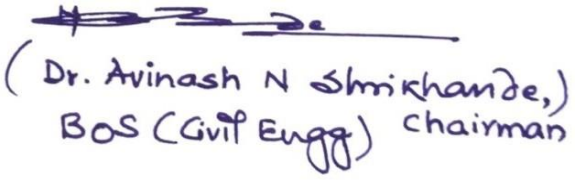
SYLLABUS

Unit No.1			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Design of RC columns subjected to biaxial moments. Design of Isolated footing, for axial load & uniaxialmoment.(square, rectangular footing)	**09**		**1**
	09		
Unit No.2			
Design of circular water tank resting on ground by IS code method (IS 3370:2021). Design of Dog-legged and Open well Staircase	**09**		**2**
	09		
Unit No.3			
Design of RCC Cantilever and Counter fort Retaining wall.	**09**		**3**
	09		
Unit No.4			
Analysis and design of portal frames (single bay single storey) hinged or fixed at base. Design of hinge connection at base Design of combined footing. Rectangular / Trapezoidal.	**09**		**4**
	09		

1. DevdasMenon, Structural Analysis, Narosa Publishing House, 2008. (ISBN: 9781842653371)
2. Hibbeler, R. C. (2002). Structural Analysis, 6/e, Pearson Education
3. Norris, C.H., Wilbur, J.B., and Utku, S., Elementary Structural Analysis, McGraw Hill
4. Wang, C.K., Intermediate Structural Analysis, McGraw Hill, 1983

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
All	IS 459-2000		2000
All	SP-16		





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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity: 0 Hrs**	**Practical (P): 0 Hrs**
Subject Code	**BTCVE506T**	**Name of Subject: Earth Retaining Structures (Elective-II)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5 Marks. for Sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To know the in-depth knowledge of various failures mechanism related to earth retaining structures.
2	To understand the types of retaining wall, stability of retaining walls.
3	To understand sheet pile and cofferdam, method of construction and distribution of earth pressure.
4	To understand the historical failures of geotechnical structures.
5	To understand the effect of water table on slopes.

Course Outcome	
After completion of syllabus student able to	
1	Think logically for mechanism of earth retaining structures.
2	Differentiate different types of retaining wall and Understand the engineering concepts of stability of retaining walls.
3	Understand about sheet pile and cofferdam and best suitable techniques for construction.
4	Gain an experience in from historical failures of geotechnical structures.
5	Gain the knowledge of effect of water table on slopes.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	-	-	1	1	1	1	-	-	2
CO2	2	2	2	2	-	1	1	1	1	1	2	2
CO3	3	3	2	2	1	1	1	1	2	1	1	2
CO4	3	3	2	1	-	1	1		-		-	2
CO5	1	2	2	-	-	-		-	-	-	-	2
Avg	**2.2**	**2.6**	**2**	**1.67**	**1**	**1**	**0.8**	**1**	**1.3**	`	**1.5**	**2**

1 Low 2 Medium 3 High

SYLLABUS

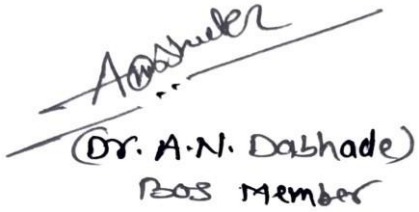
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
UNIT NO.1 Earth Pressure Theories			
Theories of earth pressure, general and local states of plastic equilibrium,	**01**		**1**
Active and Passive states in cohesive and cohesion less soil, Rankine's and Coulomb's approaches,	**03**		**1**
Effect of wall movement, uniform surcharge, wall angle, wall friction, back fill slope. Lateral pressure on wall due to concentrated construction, Culmanns method, earth pressure at rest.	**03**		**1**
Introduction to seismic design of retaining wall.	**01**		**1**
	08		
UNIT NO.2 Stability of Earth Retaining Structures			
Types of retaining wall, stability analysis of rigid type and R.C. Cantilever type retaining walls.	**03**		**2**
Introduction of Geo reinforce Wall, Gabion Wall, Soil Nailing.	**03**		**2**
	06		

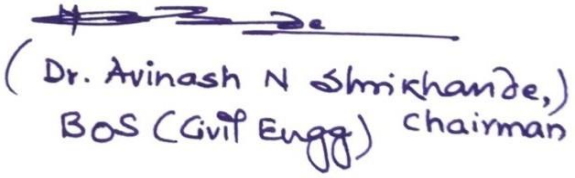
References			
UNIT NO.3 Sheet Pile and Cofferdam			
Sheet pile and cofferdam. Type, material, method of construction.	**02**		**3**
Distribution of earth pressure and related approximation. Distinction between Sheet Pile and Retaining Wall, Analysis and Design.	**05**		**3**
	07		
UNIT NO.4 Characterization of failures & Stability Of Slopes			
Historical Failures of geotechnical structures(finite and infinite slopes, high embankments such as earthen dams, tunnels, excavations, Rockfall, landslides and retaining structures etc.,)	**03**		**4**
Stability Of Slopes- Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, center of critical slip circle, slices method and friction circle. Slopes with pore pressure consideration. Taylor's stability numbers & stability charts, method of improving stability of slopes.	**04**		**4**
	07		
UNIT NO.5 Effect of water table on slopes			
Effect of water table on slopes, tension cracks, Stability of earth dams during different stages-during and at end of construction.	**04**		**5**
Steady seepage, Sudden draw down, estimation of pore water pressure, Use of stability charts.	**04**		**5**
	08		

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2,3,4,5	Basic and Applied Soil Mechanics	Gopal Ranjan and Rao	New Age International Publisher	2005	Text Book		
1,2,3,4,5	Principles of Geotechnical Engineering	Das B.M.	Thomson Bksm Cengage Publication	2002	Text Book		
1,2,3,4,5	Soil Mechanics and Foundation Engineering, Vol-I	VNS Murthy	Saikripa Consultan, Banglore	1991	Text Book		
1,2,3,4,5	Foundation Engineering Handbook	Winterkon H.F. and Fang H	--				Reference Book

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
1	Indian Standard Ports And Harbours - Plasning And Design - Code Of Practice Part 2 Earth Pressures (First Revision)	Indian Standard	Reaffirmed 2005
2	Indian Standard. Retaining Wall For Hill Area - Guidelines Part 2 Design Of Retaining/Breast Walls	Indian Standard	October 1997
3	Indian Standard Safety Code For Piling And Other Deep Foundations	Indian Standard	August 1969
4	Indian Standard Selection And Development Of Site For Building In Hill Areas - Guidelines Part 2 Selection And Development.	Indian Standard	March 1995

Applicable for Unit No.	Website address
1	https://nptel.ac.in/content/storage2/courses/105101083/download/lec7.pdf
2	https://nptel.ac.in/content/storage2/courses/105101083/download/lec26.pdf
3	https://documents.pub/document/advanced-foundation-engineering nptelacin-3-chapter-5-sheet-pile-wall-51.html
4	https://nptel.ac.in/content/storage2/courses/105101001/downloads/L22.pdf
5	https://nptel.ac.in/content/storage2/courses/105101001/downloads/L22.pdf





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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 03 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE506T**	**Name of Subject: Climate Change and its Mitigation (Elective-II)**	

Examination Scheme			
Internal Marks:	**Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	Students should be able to get knowledge about Climate system, its changes and causes
2	Students should able to learn about Green house gases and its chemistry, sources, effects & instruments used for quantification
3	Students should able to learn about the impacts of global climate change
4	Provide the knowledge of clean technology and alternate energy sources
5	To introduce the students about the mitigation of climate change

Course Outcome	
After completion of syllabus student able to	
1	To be able to understand the problem of economics of energy – environmental interaction with respect to global climate change
2	To be in a position to analysis Green house effect
3	To be in a position to analyze impact of climate change
4	To be in a position to understand the clean technology and alternate energy sources
5	To demonstrate in producing research/project report on mitigation strategies for global climate change.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	-	-	-	1	1	2	2
CO2	2	2	2	2	1	-	-	-	1	2	2	2
CO3	2	2	2	1	1	-	-	-	1	1	2	2
CO4	2	2	2	1	1	-	-	-	1	2	2	2
CO5	2	2	2	1	1	-	-	-	1	1	2	2
AVG	2	2	2	1.4	1	-	-	-	1	1.4	2	2

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Earth's Climate System

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction to Climate Change; History and Trends of Climate	02		1
Atmosphere – weather and Climate	01		
Causes of global and regional climate change	01		
climate parameters – Temperature, Rainfall, Humidity	01		
Wind – Global ocean circulation and its effect	01		
Carbon cycle	01		
	07		

Unit No.2 Greenhouse Gases

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Introduction and effect of Carbon dioxide, methane, nitrous oxide, water vapor, ozone and chlorofluorocarbons	02		2
Chemistry of greenhouse gases	01		
Sources and sinks, their cycle in atmosphere	01		
Radiative forcing	01		
Effects on plants and animals	01		
instruments used for quantification	01		
	07		

Unit No.3 Impacts of Global Climate Change			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Impacts of Climate Change on various sectors – Agriculture, Forestry	**02**		**3**
Methods and Scenarios, changes in agricultural production	**02**		
Impact on Human Health, Industry and society	**01**		
Spread of epidemics and Risk of Irreversible Changes.	**01**		
Traditional practices to cope with climate change impacts	**01**		
	07		
Unit No.4 Waste to Energy, Clean Technologies and Greener Fuels			
Details of Topic :	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to MSW & Bio waste, Biomedical, Industrial waste, International and Regional cooperation.	**02**		**4**
Alternate Energy: Hydrogen, CBS, Bio-fuels, Solar Energy, Wind, Hydroelectric Power	**02**		
Examples of future Clean Technologies, Biodiesel, Natural Compost, Eco- Friendly Plastic	**02**		
Study of waste to energy projects	**01**		
	07		
Unit No.5 Climate Change Mitigation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Climate change response measures: definition and evolution..	**02**		**5**
Introduction to mitigation of GHGs and stabilization scenario	**01**		
characteristics of mitigation in regional and national context	**01**		
mainstreaming climate change in development agenda	**01**		
short-term mitigation options Role of fossil fuels in climate change	**01**		
Role of Governments, industries, and individuals	**01**		
	07		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1	Essentials of the Earth's Climate System	Roger G. Barry & Eileen A. Hall-McKim	Cambridge University Press	1st	Text Book		
2,3	Climate Change and Greenhouse	Pratap Bhattacharya(Author),S	CRC Press	1st	Text Book		

	Gases Emissions	ushmitaMunda&Pradeep Kumar Dash					
2,3,4	Global Climate Change	Suruchi Singh, Pardeep Singh, S. Rangabhashiyam, K.K. Srivastava	Elsevier	1st	Text Book		
1,2,3	Implementing the climate regime	Jon Hovi, Olav Stokke and GeirUlfstein	International compliance, Earthscan	2005	Text Book		
5	Energy Systems and Sustainability: Power for a Sustainable Future	G Boylr, B Everest, J Ramage	Oxford	2003	Text Book		
6	Climate change and it's control	Dr. R.N.Patil, Dr. R.M. Dhoble, Dr. A. M. Bhamburkar	Book Rivers Publication ISBN: 978-93-5515-329-6	2022	Text Book		

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
1,2	Climate change and carbon markets : a handbook of emission reduction mechanisms, Earthscan by F. Yamin		2005.
1,2,3,4	Handbook of Climate Change and India by Navroz K. Dubash		2011
2,3,5	Handbook of Climate Change Management by Walter Leal Filho, Johannes M. Luetz&Dr.DesalegnYayehAyal published by Springer		2021

Applicable for Unit No.	Website address
1,2,3	Climate Change 2007: Impacts, Adaptation and Vulnerability, Summary for Policymakers, IPCC. Available at: http://www.ipcc.ch/SPM13apr07.pdf
4,5	Climate Change 2007: Mitigation of Climate Change, Summary for Policymakers, IPCC. Available at: http://www.ipcc.ch/SPM040507.pdf
1,2,3	Climate Change, The Physical Science Basis, IPCC. Available at: http://ipccwg1. ucar.edu/wg1/wg1-report.html

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture : 3 Hours**	**Tutorial//Activity (T/A): 0 Hrs**	**Practical (P): 0 Hrs**
Subject Code:-	**BTCVE506T**	**Subject: - Advanced Concrete Technology (Elective-II)**	

Examination Scheme			
Internal Marks-	**University**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(l5marks. 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 understand the knowledge of Special Concrete To know tests on concrete in plastic and hardened stage as well as behavior of concrete structure
3	To understand Design economic concrete mix proportion for different exposure conditions and intended purpose.
4	To understand the behavior and strength of concrete structure.
5	To understand the concept of durability and testing of concrete

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	Differentiate special concrete from conventional concrete 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.	Gain an experience in the implementation of Concrete Materials on Engineering concepts which are applied on Construction Fields.
5.	To Understand the various factors affecting the concrete and Advanced Non-Destructive Testing Methods.

MAPPING OF CO WITH PO

CO/ P0	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

SYLLABUS

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
UNIT NO.1 INTRODUCTION TO CONCRETE			
Historical background, composition of concrete, general note on strength mechanism, recent practice and future trends	**01**		**1**
Cement - Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement, grades of cement, testing, Hydration Process and Hydrated Cement Paste of blended cement, of cement as per Indian standard.	**03**		**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	**03**		**1**
Water - General Requirements & limiting values of impurities	**01**		**1**
	08		
UNIT NO.2 SPECIAL CONCRETE AND CONCRETING TECHNIQUES			
a)Concrete with difference cementatious materials: fly ash, GGBS, Silica fume. b) Concrete with different Aggregates: No fines, high weight, gap graded, Recycled Aggregate,Auto clave aerated concrete.	**03**		**2**
c) Modified property: high density, high performance, ultra rapid hardening concrete, transportation concrete, Fiber reinforcement concrete. d) Techniques: RMC, Underwater concrete , Shot crete, nano concrete.	**03**		**2**
	06		

UNIT NO.3 DESIGN OF CONCRETE			
Concept of Design of concrete, Quality control (field and statistical) Indian Standard Method, Comparison with British and .American Method of Mix Design. Acceptance criteria..	**02**		**3**
Design of High Strength Concrete Mixes, Design of Light Weight Aggregate Concrete Mixes, Design of Fly Ash Cement Concrete Mixes, Design of High Density Concrete Mixes, Standards, Specifications and Code of Practice.	**05**		**3**
	07		
UNIT NO.4 BEHAVIOR AND STRENGTH OF CONCRETE			
Failure modes in concrete, type deformation stress strain relation and modulus of elasticity, Shrinkage cause, Factors Affecting and control, creep, causes, Factores influencing and effects.Effects of temperature.	**04**		**4**
Compressive strength, Tensile strength, Fatigue strength, and impact strength, Factors influencing strength of concrete..	**03**		**4**
	07		
UNIT NO.5 DURABILITY AND TESTING OF CONCRETE			
Water As An Agent Of Deterioration, Permeability Of Concrete, Classification of Causes of Concrete Deterioration, Deterioration By Surface Wear/Abrasion, Freezing And Thawing of Concrete, Alkali-Aggregate Reaction (Alkali-Silica Reaction / Alkali-Carbonate Reaction), Deterioration By Fire,Guide To Durable Concrete	**04**		**5**
Advanced Non-Destructive Testing Methods: Ground Penetration Radar, Probe Penetration, Pull Out Test, Break off Maturity Method, Stress Wave Prorogation Method, Electrical/Magnetic Methods, Nuclear Methods And Infrared Thermograph, Core Test	**04**		**5**
	08		

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	MS Shetty;	S.Chand Publication New Delhi		**Text Book**		
3	Concrete Technology	PKumar Mehta,	Indian Concrete Institute		**Text Book**		
4&5	Properties Of Concrete	AM.Neville	Pearson Education		**Text Book**		
3	Concrete Technology	ML Gambhir;	Tata McGraw Hill		**Text Book**		

3	Concrete mix design for flyash and superplasticizer	Kishore kaushal	ICI bulletin	Apr-june 1997		**Researchpaper**	

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**

(Dr. A.N. Dabhade)
BOS Member

(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: V	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE506T**	**Name of Subject: Flood Control and Drainage (Elective-II)**	

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 Objective	
This course will enable students to:	
1	Understand the Concept of Flood, its effect and Causes.
2	Understand various methods of Flood Mitigation
3	Understand clearly flood routine and its effect in flood management and control
4	Understand the Problems of Drainage system in urbanization and apply the knowledge in operation and maintenance of Urban drainage system.
5	Familiarize with the concepts of systems for drainage of irrigation lands.

Course Outcome	
After Studying this course, Students will be able to:	
1	Understand the role and responsibility of engineers in Flood Mitigation.
2	Understand the role and responsibility of engineers in Estimation of Design Flood
3	Learn and apply the knowledge of GIS, remote Sensing in Natural Hazard Mitigation.
4	Apply the Concept in Operation and Maintenance of Urban Drainage System.
5	Apply the knowledge of pattern of Drainage system at Irrigation area.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE506 T CO1	3	2	2									2
BECVE506 T CO2	3	2	2	2								2
BECVE506 T CO3	3	2	3									2
BECVE506 T CO4	3	2	3									2
BECVE506 T CO5	3	2	3									2

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Flood Engineering			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Flood Engineering: General: Introduction, Basics of floods, Natural and man-made floods, Flows in catchments, Causes of flooding, Environmental and economic losses, Flood control structures. **FLOOD HAZARD MITIGATION:** Flood management measures, Flood control strategies.	**07**		**1**
	07		

Unit No.2 ESTIMATION OF DESIGN FLOOD: & FLOOD ROUTING THROUGH RESERVOIRS AND CHANNELS			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
ESTIMATION OF DESIGN FLOOD: Introduction, Methods of design flood computations: Observation of Highest Flood, Empirical flood formulae, Flood frequency studies- Gumbel's method– Design flood and design storm	**08**		**2**

(**FLOOD ROUTING THROUGH RESERVOIRS AND CHANNELS** Flood routing through reservoirs—general, basic principles of flood routing ISD method- Modified Pulse method. Flood routing through channels – Muskingum method.			
	08		

Unit No.3 Risk Management			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Risk Management: Risk assessment, Risk reduction and management, Advanced Warning Systems: Global positioning systems, Applications of remote sensing and GIS, Role of Information Technology in natural hazard mitigation management	**07**		**3**
	07		

Unit No.4 Drainage Engineering			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Drainage Engineering: Land Drainage systems: necessity-types-surfaces and subsurface drainage-design considerations. Introduction to Drainage Problems in Different Climates: Urbanisation - Its effects and consequences for drainage. Operation and Maintenance of Urban Drainage Systems: Maintenance requirements and planning, Cleansing of sewers and drains, repair options,	**07**		**4**
	07		

Unit No.5 Patterns of drainage system			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Patterns of drainage system- Drainage criteria formulation for off season drainage, crop season drainage, salt drainage- use of steady state and unsteady state approaches in formulation. - criteria for irrigated area. –incorporation of intentional and	**07**		**5**

unavoidable losses			
	07		

Text Books:

1. S.N.Ghosh, Assitant Professor in Civil Engineering Department, IIT, Kharagpur.
2. H M Reghunath, Hydrology, New Age International (P) Limited, Publishers (1987)
3. Dr. P. Jayarami Reddy, A text book of Hydrology, Laxmi publications (2005)
4. Linsley .R.K, Kohler.M.A & Palhus.J.L, Applied Hydrology, Mc Graw Hill (1949)
5. Bhattacharya A K and Michael A M, Land Drainage Principles: Methods and Applications, Konark Publishers Pvt. Ltd., New Delhi, 2003.

Reference Book:

1. Centre for Science & Environment, Wrath of Nature: Impact of Environmental Destruction on Floods and Droughts, Centre for Science & Environment, New Delhi.
2. Beven, K. and Carling, P., (eds.), Floods: Hydrological, Sedimentological and Geomorphological Implications, British Geomorphological Research Group Symposia Series, Wiley, Chichester, 1989.
3. B.H.R.A., Hydraulic Aspects of Floods & Flood Control, B.H.R.A., England, 1983.
4. Brown, J.P., Economic Effects of Floods, Springer-Verlag, Berlin, 1972.
5. Prasad, P., Famines and Droughts: Survival Strategies, Rawat, Jaipur, 1998.
6. A.K. Schwab, K. Eschelbach, David J. Brower, Hazard Mitigation and Preparedness, John Wiley, 2007.
7. Gribbin,J.E., 2014, Introduction to Hydraulics and Hydrology with Applications for Storm water Management, Cengage
8. Mays, L.W., 2001, Storm water Collection Systems Design Handbook, McGraw Hill
9. Butler and Davis, Urban Drainage, 3rd edition, 2010
10. Irrigation and Drainage paper 24. Crop water requirement. FAO, Rome, 1977.
11. Irrigation and Drainage paper 56. Crop water requirement. FAO, Rome, 1988.

(Dr. A.N. Dabhade)
BOS Member

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

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

Sem: V	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 0 hrs**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE506T**	**Name of Subject: Railway Engineering (Elective-II)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	Students should be able to explain and describe various terms in railway engineering.
2	Students should be able to explain, discriminate and design various geometric features of railway track.
3	Students should be able to define and describe the construction and maintenance steps of railway track.
4	Understand the influence of railway transportations in the society.
5	Understand the cooperation, interaction & philosophy of railway safety.

Course Outcome	
After completion of syllabus student able to	
1	Explain Components of Railway Track, different Railway Gauges
2	Design track Gradients as per given requirements
3	Discuss various Types of Track Turnouts
4	Explain Interlocking and modern signal system
5	Describe Surface Defects on Railway Track and Their Remedial Measures

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 11	PO 12
Subject Code &CO												
CO1	3	3										
CO2	3	2										
CO3	3	3	2									
CO4	3	3	1									
CO5	3	2	2	1								

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Railways Terminology			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Railway track	**08**		**1**
Gauge			**1**
Alignment of railway lines			
Engineering surveys			
Construction of new lines,			
Tracks & track stresses			**1**
	08		
Unit No.2 Rail Terminology			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Rails, sleepers, Ballast	**08**		**2**
Subgrade and formation			**2**
Track fittings and fastenings			
Creep of rails			
Geometric design of track			**2**
Curves and super-elevation			**2**
	08		
Unit No.3 Points & Crossing			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Points and crossings	**08**		**3**
Track junctions			

Simple track layouts			**3**
Rail joints and welding of rails			**3**
Track maintenance			
Track drainage			**3**
	08		

Unit No.4 Modernization of Railway Track			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Modern methods of track maintenance	**08**		
Rehabilitation of track			**4**
Renewal of track			
Tractive resistance and power			
Railway stations			
Railway yards			
	08		

Unit No.5 Signalling & Control system			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Railway tunnelling	**08**		**5**
Signalling			
Interlocking			
Modern development in railways			**5**
Development of high speed and super high speed railway track			**5**
Maintenance of railway tracks for high speed trains			**5**
	08		

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, IV&V	Railway Engineering	Saxena and Arora, Dhanpat Rai& Sons	Dhanpat Rai& Sons	I	✓	-	
I,II,III, IV&V	Railway Engineering	S.C.Rangawala	Charotar Publishing House Pvt. Ltd.	I	✓	-	

III	Railway Tracks Engineering	J.S.Mundrey, Tata McGraw-Hill Publishing	Tata McGraw-Hill Publishing	I		-	✓

(Dr. A.N. Dabhade)
BOS Member

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

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VI	**Total Hours Distribution per week**		
Total Credit: 04	**Lecture (L): 3 Hrs.**	**Tutorial/Activity (T/A): 1 Hrs.**	**Practical (P): 2 Hrs.**
Subject Code	**BTCVE601T**	**Name of Subject: Estimating and Costing**	

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**	**4 Hours**

Course Objective	
1	To differentiate the types of Estimation, adopt specification and Unit Rates.
2	To analyse rates for different items of works.
3	To interpret the drawings and estimate the Quantities of various items in civil engineering structures.
4	To understand departmental procedures and Take measurement of completed work On successful completion of this course.
5	To understand different techniques of preliminary & detailed estimation of buildings & roads.

Course Outcome	
After completion of syllabus student able to	
1	Prepare the preliminary estimate for administrative approval & technical sanction for a civil engineering project.
2	Write the specification of the works to be undertaken, prepare the tender documents, fill the contracts and make use of knowledge of different contract submission & opening in awarding the work to the contractor.
3.	Use the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project
4.	Use the technique of Rate analysis in estimating the exact cost of material & manpower and hence the entire project.
5.	Estimate the bill of quantities using different techniques of preliminary & detailed estimation of buildings & roads & Arrive the exact value of the asset (movable & immovable) using different Valuation techniques

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code &CO NO.												
1	2	2									1	3
2	1	2									2	
3									2		3	
4			2	3	2						2	
5	3	2									2	
6	3		2			2					2	

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Introduction			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction: Importance and purpose of the subject, Units of measurement as per I.S.1200. Items of work and Description of items of work,,	**01**		**1**
Administrative approvals, technical sanction, preliminary estimates. objectives, and its methods	**02**		**1**
Study of Earthwork estimates in road, hill roads and canals, methods of consumptions of earthwork.	**01**		
Detailed estimates, objects, importance, accuracy. Methods of detailed estimates, Detailed estimates of load bearing and framed structures.	**04**		
	08		
Unit No.2 Calculation of steel , Tender and contracts			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Calculation of reinforcing steel with Bar bending Schedule.	**03**		
Tenders and Contracts: Method of carrying out works, tender notice, acceptance of tender, essentials of contract, type of contracts, contract documents, land acquisition act, Legal aspects of various contract provisions, Arbitration.	**03**		**2**
Public work department procedure of work: Organisation of Engineering department, Methods of carrying out works, stores, stucks, Tools and plants, Mode of payment, Public work account, Power of sanctions	**01**		**2**
	07		

Unit No.3 Specifications:			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Specifications: IS 1200 Introduction, Purpose and principles of specifications writing, Types of specifications, writing and developing	**02**		
Detailed specifications of Important items of building and road work.	**03**		
Classification of cost, direct and indirect charges, distribution of overheads, M.A.S Account, issue rates and stores account.	**02**		**3**
	07		
Unit No.4 Rate Analysis			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction, Purpose and principles of CSR, Factors affecting analysis of rates, labour guidelines from National Building Organization, Task work.	**04**		**4**
Market rates of materials and labour, Rate analysis of major items of work	**03**		**4**
	07		
Unit No.5 Valuation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Purpose of valuation, Factors affecting property price and cost, Types of Value.	**03**		**5**
Real Estate, Tenure of land, Free hold and lease hold, sinking fund, Depreciation, and its methods, Capitalised value, Methods of valuation, Net & Gross income, Rent fixation.	**04**		**5**
	07		

(Dr. A.N. Dabhade)
BoS Member

(Dr. Avinash N Shrikhande,)
BoS (Civil Engg) Chairman

ESTIMATING AND COSTING

BTCVE601P **Evaluation Scheme: (25-Internal/25-External)**

(P-2 Hrs/Week); Total Credits-01

PRACTICAL – Minimum 8 practical assignments based on

1. Preliminary estimate using Plinth area method.
2. Detailed estimate of Load bearing structure
3. Detailed estimate of Frame structure.
4. Calculation of steel with Bar bending Schedule.
5. Detailed estimate of earthwork of road for Approximate 1km length.
6. Draft Detailed specification for 8 major items.
7. Collection of four different types of Tender
8. Calculation of annual and total Depreciation and book value of the end of each year.
9. Fixation of standard rent of property.
10. Analysis the unit rate of 8 major items of work contained.
11. Market survey for material and labour rates for various items.
12. Detailed planning and estimate of plumbing work.

Note: Collection of different bank rates of nearby location, Comparative study of different units eg- Brass, foot, meter, cm, cum etc is compulsory.

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	Estimating and Costing	by Dutta					
1 to 5	Estimating and Costing	by Chakraborty					
5	Valuation	by Roshan Namavati					
5	Philosophy of Valuation	S. S. Rathore.					

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
1 to 5	Handbook for quick cost estimates. By Ball, J R		
4	IS 14835 (2000): Guidelines for Estimating Unit Rate of Items		

(Dr. A.N. Dabhade) BoS Member

(Dr. Avinash N Shirkhande,) BoS (Civil Engg) Chairman

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem:VI	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 02 Hrs.**	**Tutorial/Activity (T/A):01Hrs.**	**Practical (P): 00 Hrs.**
Subject Code	**BTCVE602T**	**Name of Subject:Construction Engineering and Management**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Outcome	
After completion of syllabus student able to	
1	Get themselves acquainted with various economic and managerial aspects of construction industry
2	Understand the tools and techniques of economic analysis for improving their decision making skills
3	Analyze the structure of market and effects of inflation with special reference to construction industry.
4	Understand the importance of marketing management and its effect on construction industry.
5	Acquire financial acumen for construction business.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE602T1			2	2		1					3	1
BECVE602T2			2	2		1					3	1
BECVE602T3			2	2		1					3	1
BECVE602T4			2	2		1					3	1
BECVE602T5			2	2		1					3	1

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Importance of construction industry in economic development and economic growth of India. Construction- akey industry of India, Law of Demand, Law of supply, Laws of returns to the scale, types of costs	04	04	1

Unit No.2

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Factors of production with special reference to construction industry, Turnkeyconstructionprojects,Deprecation- its types and methods, The concept of business cycle, Affordable housing schemes by Government of India	04	04	2

Unit No.3

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Types of market structure, Monopoly, oligopoly and monopolisticcompetition, Recession,inflation and Deflation, Direct	04	04	3

Details of Topic	Allotment of Hours		Mapped with CO Number
and indirect taxes			
Unit No.4			
Details of Topic	**L**	**T/A**	**CO**
Meaning of Marketing managements, concepts of Marketing, Marketing Mix, Administrative and cost plus pricing, Channels of distribution, Advertising and sales promotion	**03**	**03**	**4**
Unit No.5			
Details of Topic	**L**	**T/A**	**CO**
Meaning, Nature and scope of Financial management, Sources of Finance, profit and loss account, Balance sheet, merger and acquisitions of business, Concept of stock market	**04**	**04**	**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,IV,V	Modern Economics	H.L. Ahuja					YES
	Monetary Economics	M.L. Seth					YES
	Industrial Management	I.K. Chopde, A.M. Sheikh					YES
	Business Organization and Management	S.A. Sherlekar					YES
	Modern Economic Theory	K.K. Dewett					YES

(Dr. A.N. Dabhade)
BoS Member

(Dr. Avinash N Shrikhande,)
BoS (Civil Engg) Chairman

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FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VI	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE603T**	**Name of Subject: Water Resource Engineering**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To describe occurrence, movement and distribution of water and to estimate water abstractions, runoff and hydrographs
2	To study the concepts of irrigation and different systems and methods of irrigation and to estimate the quantity of water required by crops.
3	To determine storage capacity of reservoir and to analyse and design earth dams
4	To analyse and design gravity dams and to study types of spillways and energy dissipators
5	To design unlined and lined channels and study the concept of other irrigation structures

Course Outcome	
After completion of syllabus student able to	
1	Understand occurrence, movement and distribution of water and estimate water abstractions, runoff and hydrographs
2	Illustrate different systems and methods of irrigation and estimate the quantity of water required by crops and estimate the quantity of water required by crops.
3	Estimate reservoir capacity and analyse and design earth dams
4	Design and analyse gravity dams and illustrate types of Spillways and energy dissipators
5	Design unlined and lined channels and illustrate concepts of other irrigation structures

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE603T CO1	1	3	3	2								2
BECVE603T CO2		3	2									2
BECVE603T CO3	1	3	3	2								2
BECVE603T CO4	1	3	3	2								2
BECVE603T CO5		3	3	2								2

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Hydrology

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Hydrologic cycle, Water availability in India, Water balances, National Water Policy	**01**		**1**
Precipitation: Types, Measurement, Data analysis and presentation, Probable Maximum Precipitation	**02**		**1**
Evaporation and its measurement, Evapotranspiration and its measurement, Penman Monteith method, Infiltration: Horton's equation and Green Ampt method.	**02**		**1**
Concept of basin as a unit for development, Runoff: drainage basin characteristics, Estimation of runoff, Streamflow measurement	**02**		**1**
Concepts of unit hydrograph, S-curve hydrograph, Synthetic hydrograph, Stage discharge curve	**02**		**1**
	09		

Unit No.2 Water application and Irrigation methods

Details of Topic:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Systems of Irrigation: Lift irrigation, Tank irrigation, Well irrigation,	**02**		**2**

Irrigation methods: Surface and Sub-Surface Irrigation, Sprinkler and Drip Irrigation	**02**		**2**
Duty, Delta and Base period, Computation of duty and frequency of Irrigation	**02**		**2**
Soil Moisture and Consumptive use, Irrigation water quality, Crop rotation and Irrigation assessment	**02**		**2**
	08		
Unit No.3 Reservoir and Earthen dam			
Details of Topic:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Reservoir: Types, Investigations, Site selection, Zones of storage,	**01**		**3**
Safe yield, Reservoir storage capacity, Reservoir sedimentation and control.	**02**		**3**
Dams: Types of dams, Earth and rockfill dams, typical sections of earth and rockfill dams	**02**		**3**
Analysis and design of earthen embankments, seepage control in earth dams	**03**		**3**
	08		
Unit No.4 Gravity Dams and spillways			
Details of Topic:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Gravity dams, overflow and non-overflow sections, Forces acting on Gravity dams	**02**		**4**
analysis and design of gravity dams, Foundation treatment in concrete dams, joints, water seals, galleries in concrete dams	**03**		**4**
Types of spillways, design of Ogee spillway,	**01**		**4**
Types of gates in spillways and types of energy dissipation below spillways	**01**		**4**
	07		

Unit No.5 (Canals and hydraulic structures)			
Details of Topic:	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Alignment of canals, canal capacity, losses, FSL of canal, Kennedy's silt theory, Lacey's regime theory, use of Garrets diagrams and Lacey's Regime diagrams	**03**		**5**
Lining of irrigation channels, design of lined canal, balancing depth, Cross section of an Irrigation channel	**02**		**5**
Water logging: Causes, surface and sub-surface drains	**01**		**5**
Introduction: hydraulic structures, storage, diversion, conveyance and distribution structures	**01**		**5**
	07		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	**Research paper**	**Reference book**
1	A Textbook of Hydrology	Dr. P. Jaya Rami Reddy	University Science Press		Yes		
1	Engineering Hydrology	Subramanya, K.	Tata McGraw Hill, New Delhi				Yes
2 to 5	Irrigation Water Resources and Water Power Engineering,	Modi, P.N.	Standard Book House, New Delhi		Yes		
2 to 5	Irrigation Engineering	G. S. Birdie and R. C. Das	Dhanpat Rai Publishing Company pvt. Ltd., New Delhi				Yes
2 to 5	Irrigation Engineering and Hydraulic Structures	Garg Santosh Kumar	Khanna Publishers, New Delhi.		Yes		

Applicable for Unit No.	Website address
1	http://nptel.iitm.ac.in
2 to 5	http://www.uiowa.edu
2 to 5	http://www.ngwa.org
2 to 5	http://nptel.iitm.ac.in/video.php?courseId=1029&v=XmO2pltg7YBz /m3l09.pdf
2 to 5	http://nptel.iitm.ac.in/video.php?courseId=1029&v=SO0suW7TLiCs
2 to 5	http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l02.pdf
2 to 5	http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l03.pdf
2 to 5	http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l05.pdf
2 to 5	http://nptel.iitm.ac.in/courses/Webcourse contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l0

(Dr. A.N. Dabhade)
BOS Member

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

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

Sem: VI	**Total Hours Distribution per week**		
Total Credit:01	**Practical (P): 2Hrs.**		
Subject Code	**BTCVE606P**	**Name of Subject: Computer Aided Civil Engineering Drawing**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	
50 Marks	**50 Marks**	**50 Marks**	

List of Practical's- (Any Eight)

1. Introduction to Auto-CAD
2. Auto CAD – Basics Drawing, Editing and Dimensioning
3. Preparation of 2-D drawings using Auto CAD – Plan, Elevation, section and layout of Building. Preparation of Submission drawing for the local sanctioning authority- Residential Building.
4. Preparation of 2-D drawings using Auto CAD – Plan, Elevation, section and layout of Building. Preparation of Submission drawing for the local sanctioning authority- Public Building.
5. Preparation of 2-D drawings using Auto CAD of reinforcement detailing of Civil Engineering Structures specially foundation,slab,beam and staircase.
6. To prepare submission drawing of Bridge.
7. To prepare submission drawing of Slab and culvert.
8. To prepare submission drawing of underground water reservoir
9. 3-D drawing of residential building by using Auto CAD
10. Creation of 3 D models of simple objects and obtaining 2-D Multiview drawings by using Auto CAD.

(Dr. A.N. Dabhade)
BOS Member

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

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B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VI	**Total Hours Distribution per week 3-0-0**		
Total Credit:	**Lecture (L): 03Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 00 Hrs.**
Subject Code	**BTCVE604T**	**Name of Subject: Prestressed Concrete (Elective-III)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To familiarize the students with concept of pre-stressed concrete.
2	To impart knowledge to design pre-stressed concrete structures.

Course Outcome	
After completion of syllabus student able to	
1	Understand the behaviour of pre-stressed concrete.
2	Design of the pre-stressed concrete structures.
3	Understand the knowledge of basic theories and fundamental behaviour of prestress concrete.
4	Perform the analysis and design of pre-stress elements.
5	Apply the fundamental knowledge to the solution of practical problems.

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	3	2	-	-	-	-	-	-	-	3
CO2	3	3	3	2	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3
Avg CO	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

1 Low 2 Medium 3 High

SYLLABUS

	Allotment of Hours		**Mapped with CO Number**
	L	**T/A**	**CO**
Unit No.1			
Partial pre-stressing, Analysis and design of End Blocks as per IS 1343 Method. (Only comparative study with the other methods is expected) Use of un-tensioned reinforcement. Types of pre-stressed concrete structures - Type – I, II, and III. Effect of Post-tensioning on axial Compression and tension members	**09**		**1**
	09		
Unit No.2			
Design of pre-stressed concrete Rectangular beam and one way slab by Limit state method, cable profile, Limiting zone of cable profile. Deflection of pre-stressed concrete beams (short-term, and long term) Shear and Torsional resistance of the pre-stressed concrete members, principal tension. Behavior of unbounded and bonded pre-stressed concrete beams	**09**		**2**
	09		

Unit No.3			
Composite construction of pre-stressed concrete structures and in-situ concrete, Differential shrinkage, deflection, flexural strength, serviceability (Limit state) of the composite sections. Introduction to application of pre-stressing to continuous beams, primary and secondary moment, Linear transformation and concordant cables	**09**		**3**
	09		
Unit No.4			
Flexibility Influence coefficient, Analysis of single-storey, single-bay fixed portal frame. Analysis and design of circular water tank, fixed, hinged, use of (IS-3370-2021)	**05**		**4**
	05		
Unit No.5			
Design of pre-stressed concrete poles, Special problems in pre-stressed concrete structures like corrosion, fatigue, dynamic behavior of pre-stressed concrete beams, behavior of pre-stressed concrete structures under fire.	**04**		**5**
	04		

RECOMMENDED BOOKS:

1 Pre-stressed Concrete by Dr, N. Krishna Raju

2 Pre-stressed Concrete by Dr. TY Lin

3 Pre-stressed Concrete by N. Rajgopalan, Narosa Publishing House, Mumbai, Ed. II- 2007.

4 Pre-stressed Concrete Design & Construction- Leonhardt F. Ernst Wilhelm and Sohen, Publ

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
All	**IS 1343** ***Prestress Concrete-Code of Practice***		**2012**

(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: VIth	**Total Hours Distribution per week**		
Total Credit: - 03	**Lecture : 03 Hours**	**Tutorial//Activity: 0 Hrs**	**Practical(P): 0 Hrs**
Subject Code	**BTCVE604T**	**Subject: - Soil Dynamics (Elective-III)**	

Examination Scheme			
Internal Marks-	**University Marks**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5 Marks for sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3Hours**

Course Objectives	
1	To enchance students knowledge in dynamic loading
2	To enchance students knowledge in theory of vibrations.
3	To know the dynamic soil Properties, to train the students in machine foundation design.
4	To know the occurrence of liquefaction and the analyzing it.
5	Learn procedure of analysis & Design of different types of Machine foundation.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand basics of soil dynamics, theory of vibration, propagation of body waves and surface waves through soil.
2	Understand different laboratory and field tests to determine dynamic soil properties required for design purpose
3	Understand liquefaction mechanism and evaluation of liquefaction potential studies by various tests
4	Understand the general requirements of machine foundation, and criteria for its design.
5	Understand analysis & design of different types of Machine foundation required in the field

MAPPING OF CO WITH PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	2	2	1	--	--	2	2
CO2	3	2	1	2	--	--	2	1	--	1	--	2
CO3	2	1	2	2	--	2	--	2	--	--	--	1
CO4	3	2	1	1	1	2	2	1	--	2	--	2
CO5	3	2	2	2	2	--	--	1	--	--	2	2
Avg	**2.8**	**1.8**	**1.6**	**1.6**	**1.33**	**2**	**2**	**1.2**	**--**	**1.5**	**2**	**1.8**

1 Low 2 Medium 3 High

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	**T/A**	**CO**
UNIT NO.1 Introduction to Dynamic loading			
Earthquake loading, machine vibrations, blast loading, background and lessons leant from damages in past earthquakes due to soil and ground failure,	**04**		**1**
Effect of soil properties on seismic response of structures, seismic waves and their characteristics.	**03**		**1**
	07		
UNIT NO.2 Soil Dynamics and its applications			
Fundamentals of vibrations: single, two and multiple degree of freedom systems, vibration isolation, vibration absorbers, vibration measuring instruments.	**03**		**2**
Wave propagation: elastic continuum medium, semi-infinite elastic continuum medium, soil behaviour under dynamic loading.	**04**		**2**
	07		
UNIT NO.3 Dynamic elastic constant of soil			
Stress-strain behaviour of cyclically loaded soils, effect of strain level on the dynamic soil properties, measurement of seismic response of soil at low and high strain, using laboratory tests	**03**		**3**
Cyclic triaxial, cyclic direct simple shear, resonant column, shaking table, centrifuge and using field tests - block vibration test, cross bore hole, their suitability and limitations, Interpretation of results, IS Codes	**04**		**3**
	07		
UNIT NO.4 Liquefaction of soils			
Liquefaction mechanism, factors affecting liquefaction, liquefaction of cohesionless soils and sensitive clays, liquefaction susceptibility,	**4**		**4**
Evaluation of liquefaction potential studies by dynamic tri-axial	**3**		**4**

testing, oscillatory shear box, shake table and blast tests.			
	07		
UNITNO.5 Machine Foundation			
Introduction: Types of machines, Types of machine foundations, Modes of vibrations, General requirements of machine foundation, General criteria for design, permissible amplitude	**02**		**5**
Analysis & Design of Machine foundation: Elastic homogeneous half space and lumped parameter solutions, analysis and design of foundations for reciprocating and impact type machines, turbines, effect of machine foundation on adjoining structures.	**03**		**5**
vibration isolation& control: Force isolation & motion isolation, Methods of isolation in machine foundations Isolating materials and their properties Bearing capacity of foundations: Introduction to bearing capacity of dynamically loaded foundations	**03**		**5**
	08		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2,3,4,5	Advanced Soil Dynamics and Earthquake Engineering	Bharat Bhushan Prasad	PHI (1 December 2010)		Yes		
1,2,3,4,5	Fundamentals of Soil Dynamics	Braja M. Das	Elsevier, 1983				Yes

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
5	Indian Standard Code Of Practice For Design And Construction Of Machine Foundations Part 1 Foundation For Reciprocating Type Machines	Indian Standard	December 1982
1,2,3,4	Handbook of Soil Mechanics: Soil Mechanics of Earthworks, Foundations and Highway Engineering v.3 Hardcover – Import, 1 September 1988.	Elsevier Science Ltd; Revised, Subsequent edition	1 September 1988

Curtes G. Ronde

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VI	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 03 Hrs**	**Tutorial/Activity (T/A): 00Hrs.**	**Practical (P): 00Hrs.**
Subject Code	**BTCVE604T**	**Name of Subject: Environment Management (Elective-III)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Maximum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

List of Course Objective	
1	To develop, implement, monitor and maintain environmental strategies, policies, programmes and systems that promote sustainable development.
2	To identify and understand the major environmental management systems responsible for carrying out any sustainable development.
3	To oversee the environmental performance including compliance with environmental legislation across the organization.
4	To lead the implementation of environmental policies and practices and raise awareness, at all levels of an organization, about the emerging environmental issues.
5	To coordinate all aspects of pollution control, waste management, environmental health and conservation.

List of Course Outcome	
After completion of syllabus student should be able to	
1	Identify the scientific and social aspects of environmental issues.
2	Understand the procedure of environmental impact assessment.
3	Identify and evaluate and the environmental risk assessment involved in the EMP.
4	Understand the importance of the process of Environmental Audit and vital parameters associated with it.
5	Understand the role of environmental management system in protecting the resources using environmental legislations.

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 (Introduction)			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to Environmental Management: Objectives, Standards of living	**2**		**1**
Goals and components of Environmental Management, Socio-economic context.	**2**		**1**
Environmental Sustainability and sustainable development, issues and constraints	**2**		**1**
Environmental values and ethics	**1**		**1**
	7		
Unit No.2 (Environmental Impact Assessment)			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Environmental Impact Assessment (EIA) – Definition, History and Objective	**1**		**2**
Role, Benefits and flaws of EIA in India,	**1**		**2**
EIA Procedures	**1**		**2**
Key elements of EIA: Screening, scoping identifying and evaluating impacts	**2**		**2**
Mitigations and issuing environmental statements.	**1**		**2**
Environmental Impact Statement	**1**		**2**
	7		
Unit No.3 (Environmental Risk Analysis)			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Environmental Risk Analysis: Fundamentals of hazards, exposure & risk assessment management.	**2**		**3**
Basic Steps in risk management- hazard identification, exposure assessment & risk characterization.	**2**		**3**
Stages in the prior Environmental Clearance (EC), Process for New Projects: Screening, scoping, public consultation	**3**		**3**

Critical environmental issues and formulation of strategies of Environmental Management Plan (EMP)	**2**		**CO3**
	9		

Unit No.4(Environmental Audit)

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Environmental Audit (EA)- Concept of EA, procedural aspects of conducting environmental audit,	**2**		**4**
Environmental Management System (EMS), Life Cycle Assessment and Management (LCA),	**2**		**4**
ISO environmental standards: Introduction to ISO 1400 series, International voluntary standards	**1**		**4**
Eco marks and eco labelling: Assuring the quality.	**1**		**4**
Post Project Monitoring	**1**		**4**
	7		

Unit No.5 (Environmental legislation)

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Environmental Policy, Law And Appraisals –various enactment and their provisions	**2**		**5**
Role of State & Central boards of pollution control	**1**		**5**
Cleaner Technology of production	**1**		**5**
Energy Impact Analysis: Energy sources, Importance of energy impact analysis	**2**		**5**
Resource Management: Mineral, Energy, Water, Renewable, Food, Land and its depletion– causes & effects, Optimization of resource utilization.	**2**		**5**
	8		

References

Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
Unit I	An Introduction to Environmental Management	Anand Bal	Himalaya Publishing House				
Unit II,III,IV	Environmental Impact Assessment	John Rau & Wooten	Mc Graw Hill				
Unit II,III,IV	Environmental Impact Assessment	Larry Canter	Mc Graw Hill				
Unit II,III,IV	The New Environmental Age	R.K. Sapra, S. Bhardwaj	Ashish Pub. House, New Delhi				
Unit V	Environmental Law and Policy in india, Cases, Materials And Statutes	Rosencrannz, S. Divan, M.L. Nobal	Tripathi Pvt. Ltd. Bombay.				

Unit V	Environmental Legislation of India	Gupta, K.R.,	Atlantic Publishers, 2006				

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VI	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 1 Hrs.**	**Practical (P):**
Subject Code	**BTCVE604T**	**Name of Subject: Repairs & Rehabilitation of Civil Engineering Structures (Elective- 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 Objective	
1	Familiarize Students with deterioration of concrete in structures
2	Equip student with concepts of NDT and evaluation
3	Understand failures and causes for failures in structures
4	Familiarize different materials and techniques for repairs
5	Understand procedure to carryout Physical evaluation of buildingsand prepare report

Course Outcome	
After completion of syllabus student able to	
1	Explain deterioration of concrete in structures
2	Carryout analysis using NDT and evaluate structures
3.	Assess failures and causes of failures in structures
4.	Carryout Physical evaluation and submit report on condition of the structure
5.	Carryout analysis of structures and take preventive action as per conditions & Requirement

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Deterioration of concrete in structures			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Physical processes of deterioration like Freezing and Thawing, Wetting and Drying,	**02**		**1**
Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion,	**02**		**1**
Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes,Mechanism, Effect, preventive measures. -	**02**		**1**
Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures.	**02**		**1**
	08		

Unit No.2 Non Destructive Testing			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Nondestructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity,	**03**		**2**
Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting-	**02**		**2**
Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.	**02**		**2**
	07		

Unit No.3 Failure of buildings			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Definition of building failure-types of failures- Causes of Failures- Faulty Design,	**02**		**3**
Accidental over Loading, Poor quality of material and Poor Construction practices-	**02**		**3**
Fire damage - Methodology for investigation of failures-diagnostic testing methods and equipments-repair of cracks in concrete	**03**		**3**
	07		
Unit No.4 Materials for repair and rehabilitation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects –	**04**		**4**
Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.	**03**		**3**
	07		
Unit No.5 Investigation of structures &Repair Techniques			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Distress, observation and preliminary test methods. Case studies: related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures.	**03**		**3**
Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes.	**04**		**5**
	07		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Refer ence book**
1 to 5	Maintenance & Repair of Civil Structures	B.L. Gupta & AmitGupta			yes		
1 to 5	Rehabilitation of Concrete Structures	B. Vidivelli	Standard Publishers		yes		
1 to 5	Concrete Bridge Practice Construction, Maintenance & Rehabilitation	V. K. Raina			yes		
1 to 5	Concrete Structures-protection Repair and Rehabilitation	R. Doodge Woodson	BH Publishers				
1 to 5	Repair and protection of concrete structures by	Noel P.Mailvaganam,	CRC Press,	1991		yes	
1 to 5	Concrete repair and maintenance Illustrated	Peter.H.Emmons,	Galgotia publications Pvt. Ltd.,	2001.			yes
1 to 5	Earthquake resistant design of structures	Pankaj Agarwal & Manish shrikande	PHI,	2006.	yes		

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
1 to 5	Handbook on repair and rehabilitation of RCC buildings	CPWD, Government of India.	
1 to 5	Handbook on seismic retrofit of buildings A. Chakrabarti et.al., Narosa PublishingHouse, 2010.		

(Dr. A.N. Dabhade) BOS Member

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

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

Sem: VI	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE604T**	**Name of Subject: Water Transmission and Distribution Systems (Elective-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 Objective	
1	To learn the concept of computation of optimal diameter of rising main based on the various cost elements involved in it
2	To estimate the storage capacity of a distribution reservoir and to discuss various components of distribution reservoir
3	To discuss various methods of analysis of a water distribution network
4	To study various criteria of planning of an optimal water distribution network
5	To know the methods of the optimal design of water distribution network and their suitability

Course Outcome	
After completion of syllabus student able to	
1	Understanding the various head loss formula used for water distribution design and also know the methodology of optimal diameter of pumping main
2	Estimation of storage capacity of a distribution reservoir and also to understand the utility of various appurtenance used in WDN
3	Understand the concepts of various methods of analysis of WDN
4	Understanding various techniques of the optimal planning of water distribution network
5	Implementation of various methods of optimal water distribution network design

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE604T CO1	3	3	3	2	2	3						
BECVE604T CO2	3	3	3	2	2	2	1					
BECVE604T CO3	3	3	3	2	2	2	1					
BECVE604T CO4	3	3	3	2	2	2	1					
BECVE604T CO5	3	3	3	2	2	2	1					

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
	Allotment of Hours		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction- General principle used in pipe line design, various components of water transmission and distribution systems, Head loss formula, minor losses, equivalent pipe concept	**04**		**1**
Rising main- Basic requirements, Types, diameter computation by considering various cost elements. Optimal diameter of rising main	**04**		**1**
	08		
Unit No.2			
	Allotment of Hours		**Mapped with CO Number**
	L	**T/A**	**CO**
Distribution reservoirs- impounding and service reservoirs, necessity, various storages, location and height, various component parts, capacity computation.	**03**		**2**
Design principle of water distribution system- Planning, design and analysis of WDN, component parts	**01**		**2**
Pipe appurtenances- Various valves and fittings, pumps, pressure release valve and check valves	**03**		**2**
	07		
Unit No.3			
	Allotment of Hours		**Mapped with CO Number**
	L	**T/A**	**CO**
Analysis of water distribution network- Parameter inter relationship,	**08**		**3**

formulation of equations, types of problem, Hardy cross method, Newton Raphson method, Linear theory method, Electrical analogy method, Multi reservoir system analysis			
	08		

Unit No.4

	Allotment of Hours		**Mapped with CO Number**
	L	**T/A**	**CO**
Node Flow analysis- Node Head Analysis (NHA) and Node Flow Analysis (NFA), Node classification, Node flow compatibility, NFA of serial network	**04**		**4**
Planning of an optimal network-Branching of network, selection of branches computation of first trial HGL values	**04**		**4**
	08		

Unit No.5

	Allotment of Hours		**Mapped with CO Number**
	L	**T/A**	**CO**
Design of optimal WDN- Various approaches, cost head loss ratio criterion, Linear Programming technique, introduction to non linear programming	**8**		**5**
	08		

References

Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1 and 2	Analysis of Water distribution Systems	T.M.Walski	C.B.S.Publication	1984	Yes		
3	Analysis of Flow in pipe network	Jepson R.W.	Ann Arbor Science, Michigan USA	1997		Yes	
3	Analysis of Flow in pipe network	Gupta Rajesh Bhave P.R.	Narosha Publishing House New Delhi	2013	Yes		
3	Analysis of Water Distribution Network Part I	Dr. P.R.Bhave	Journal of IWWA Vol XIII No. 2	1981			Yes

	to Part III						
3	Node Flow analysis of Serial water distribution System	Dr. P.R.Bhave	Journal of IWWA Vol XII	1981			Yes
4 and 5	Non Computer Optimisation of Single source network	P.R. Bhave	Journal of Environmental Engg. Div. ASCE	1978			Yes

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VI	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 0hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE604T**	**Name of Subject: Urban Transportation Planning (Elective III)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	Students should be able to explain and describe improving transport economic efficiency for transport providers and business user
2	Students should be able to explain, generate alternatives for improving transportation system
3	Students should be able to describe the future demand and selecting the best alternative after proper evaluation
4	Improve mobility levels for the urban poor through promotion of affordable urban transport plans, programmes and technologies
5	Increase the efficiency of existing transport operations through improved planning and management of all modes of transport

Course Outcome	
After completion of syllabus student able to	
1	Explain the characteristic of urban transportation, structure of urban transportation and classification of urban roads.
2	Describe the objectives of transportation planning, data collection for planning and environmental impact analysis.
3	Explain the process of travel demand forecasting & need for interation in different modes of transportation.
4	Describe the use of intelligent Transport System and need to accommodate non-motorized transports.

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 11	PO 12
Subject Code &CO												
CO1	3	3										
CO2	3	2										
CO3	3	3	2									
CO4	3	3	1									
CO5	3	2	2	1								

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Urbanization and Transportation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Importance of urban area	**08**		**1**
Structure of urban area			**1**
Urban design			
Use of road space			
Classification of urban roads			
	08		
Unit No.2 Urban Transportation Characteristics			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Factors influencing transportation needs	**08**		**2**
Transportation demand			**2**
Type of trips			
Mode of travel, urban transportation scene in India			
Road congestion			**2**
Impact of transport on environment			**2**
	08		
Unit No.3 Transportation Planning Process			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Urban transportation planning objectives	**08**		**3**
Urban transportation system			

Urban transportation planning process			**3**
Data collection			**3**
Surveys for data collection			
Environmental impact analysis			**3**
	08		

Unit No.4 Travel Demand Forecasting			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Trip generation and attraction analysis	**08**		
Trip distribution models			**4**
Model split analysis			
Route assignment analysis			
	08		

Unit No.5 Public Transportation, Innovations in Urban Transportation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Bus transport characteristics, bus route planning, performance indicator	**08**		**5**
Types of rail transit, rail transit system development in Indian cities, Integrated Transport System, Modes of Integrated transport systems			
Need for innovative approaches			
Track guided bus			**5**
BRT, GIS, ITS			**5**
Functional areas of ITS			**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, IV&V	Traffic Engineering and Transport Planning	L R Kadiyali	Khanna	I	✓	-	
I,II,III, IV&V	Urban Transportation	D. J. Victor & S. Ponnuswamy	Tata McGraw - Hill	I	✓	-	
III	Transport Planning and Traffic engineering	C A O' Flaherty	Butter Worth-Heinemann	I		-	✓
I,II,III,	Urban	P. Anbalagan	Bookwell	I		-	✓

IV&V	Development and Sustainable Transport		Publications				
I,II,III, IV&V	Urban Transporation Planning	Michael Meyer & Eric Miller	McGraw - Hill	II		-	✓

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VII	**Total Hours Distribution per week: 3-1-0**		
Total Credit:4	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A):1 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE701T**	**Name of Subject: Design of Steel Structure**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**4 Hours**

Course Objective:	
1	To understand the properties of various rolled and built-up sections.
2	To understand the possible failure modes of structural members.
3	Applying various checks for strength assessment and design the member.

Course Outcome	
After completion of syllabus student shall be able to	
1	Use the knowledge of structural properties in assessing its strength and understand design philosophy.
2	Apply the knowledge of various techniques in analysing and design the members subjected to axial loading.
3	Make use of knowledge of analysis in structural planning and design of various components of building subjected to bending.
4	Apply engineering concept to design members subjected to complex nature of loading.
5	Make use of knowledge to design footings.

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	3	3	2			3	2	2		3
CO2	3	3	3	3	2			3	2	2		3
CO3	3	3	3	3	2			3	2	2		3
CO4	3	3	3	3	2			3	2	2		3
CO5	3	3	3	3	2			3	2	2		3

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1: (Introduction to design philosophy and Structural fasteners)			
Details of Topic:	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Steel as a structural material and its properties, various rolled sections, Introduction to plastic analysis: Shape factor, plastic hinge formation and collapse mechanism for beams. concept of Limit state design philosophy, Introduction to IS 800:2007 and steel table.	2		1
Types of joints and fasteners: Lap joint, Butt Joint with single and double cover plate, packing plate. Efficiency of joint.	2		1
Types of Bolts, Ordinary and HSFG bolts, shearing, bearing and ultimate tensile strength of bolts, prying force, Strength reduction factors, Bolt strength.	2	1	1
Types of weld, size and effective throat, fillet and butt weld, intermittent weld, weld strength.	2	1	1
	8		
Unit No.2 (Design of Axially Loaded Members)			
Tension members: Yield and rupture strength of plate, chain and staggered arrangement of fasteners, Block shear failure, shear lag effect in angles. Lug angle.	4	1	2
Compression Members: Behaviour of slender compression member, local and overall buckling, section classification, effect of initial out of straightness, eccentricity and residual stresses, Elastic stability of	4	1	2

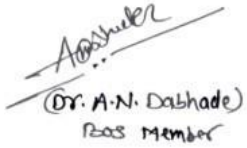
columns, Perry- Robertson approach and IS provisions. Design of rolled I, angle and Chanel sections.			
	8		
Unit No.3 (Design of Members subjected to Bending.)			
Simple Beam: Elastic and plastic behaviour, flexural strength, Low and high shear cases, deflection, web buckling and web crippling effect. Laterally supported and unsupported beams. Design of rolled I section.	**2**		**3**
Design of Built up Beams and plated rolled beam.	**2**	**1**	**3**
Plate girder: Serviceability criterion, flexural and shear strength, Simple post critical method and tension field theory, longitudinal and transverse stiffeners, Design of welded plate girder. Curtailment of plates.	**4**	**1**	**3**
	8		
Unit No.4 (Design of Members subjected to Combined Loading)			
Members subjected to axial load and uniaxial or biaxial bending. Design of Beam – Column.	**4**	**1**	**4**
Design of Built up Column, economical section, Single and double lacing, battened columns.	**4**	**1**	**4**
	8		
Unit No.5 (Design of Column Bases)			
Design of slab base, gusseted base and moment resistant bases.	**4**	**1**	**5**
	4		

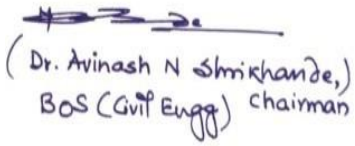
References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
All	Design of Steel structures	N Sbramanian	Oxford university press	First edition 2008	Text book		
All	Fundamentals of Structural Steel Design	M L Gambhir	McGraw Hill Education (India) Pvt ltd	First edition 2013	Text book		
	Design of Steel structures	S Ramamurtham	Dhanpat Rai publishijng Company	Second edition 2014			Reference book
	Limit State	V L Shah and	Structures	Second			Reference

	Design of Steel structures	S R Gore	Publication	edition2010			book
5	Design of Steel structures	S K Duggal	Tata McGraw		Text book		

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
All	Indian Standard For General Construction In Steel – Code of Practice		2007
	Steel Structural Handbook / Steel Table		





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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 00 Hrs.**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 06 Hrs.**
Subject Code	**BTCVE706P**	**Name of Subject: Project Work Phase-I**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
50 Marks	**50 Marks**	**50 Marks**	**--**

Course Objective	
1	The objective of the course is to give awareness of practical application of various theoretical concepts in the field of Civil Engineering.
2	The objective of Project Work Phase I is to enable the student to take up investigative study in the broad field of Civil Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or minimum two/ maximum six students in a group, under the guidance of Project Guide.

Course Outcome	
After completion of syllabus student able to	
1	Understand organizational skills & professional practices
2	Interpret the communication skills of organizational members with each other
3	Collection of data for analyze/design the Civil Engineering problem by using appreciate methodology in a team work.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE507P1					3				2	2		1
BECVE507P2					3				2	2		1
BECVE507P3					3				2	2		1

1 Low 2 Medium 3 High

SYLLABUS

Part A: INTERNSHIP

(25 Marks Internal and 25 Marks External)

After successful completion of internship of 3 to 4 weeks, students have to give internship report.

Part B: SEMINAR

(25 Marks Internal and 25 Marks External)

A group of students is expected to take up a project from Civil Engineering field which is to be started in Semester VII and to be completed in Semester VIII.

The project work may include,

- Experimental analysis / verification,
- Development of design methods and verification,
- Design and fabrication of a model for a civil engineering project,
- Design for civil engineering structures and preparation of working drawings,
- Developing a software for analysis and / or design of decision making in civil engineeringand management practice
- Technical and / or economic feasibility study
- Study on new materials / methodology for construction

The students may be asked to work in groups with not more than Six students in each group.

Basic study through review of literature on the topic selected shall be completed. The scope of the project, necessary data, sources of such data etc. shall be identified. The group of students has to prepare a brief report on the work done during the semester and is to be submitted. The report should at least include Introduction, Aim and objective of the project, scope of the project, methodology, and review of literature and reference list. The group shall prepare and present a seminar based on this work.

(Dr. A.N. Dabhade)
BoS Member

(Dr. Avinash N Shrikhande,)
BoS (Civil Engg) Chairman

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

Sem:VII	**Total Hours Distribution per week 3-0-0**		
Total Credit:03	**Lecture (L):- 03 Hrs**	**Tutorial/Activity (T/A):- 00Hrs.**	**Practical (P):00 Hrs.**
Subject Code	**BTCVE702T**	**Name of Subject: Advanced RCC Design (Elective-IV)**	

Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**4 Hrs**

Course Objective	
1	To understand the philosophies of design of reinforced cement concrete and to justify this is the best
2	To know design of advanced structural elements with safety, stability and economical way
3	To study of provisions in IS 1893 and IS 456 for design of structures

Course Outcome	
After completion of syllabus student able to	
1	Understand the conceptual design of overhead circular service reservoirs.
2	Analysis and design of Highway Bridge: Slab type and Girder type
3	Analyze and Design building frames using Limit state Method.
4	Select the parameters in beam theory for design cylindrical shells
5	Design Silos using Limit state Method.

MAPPING OF CO WITH PO

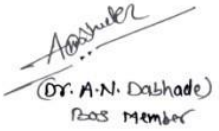
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code &CO NO.												
CO1	3	3	3	-	2	-	-	2	-	3	-	3
CO2	3	3	3	-	2	-	-	2	-	3	-	3
CO3	3	3	3	-	2	-	-	2	-	3	-	3
CO4	3	3	3	-	2	-	-	2	-	3	-	3
CO5	3	3	3	-	2	-	-	2	-	3	-	3
Avg CO	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**2**	**-**	**3**	**-**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

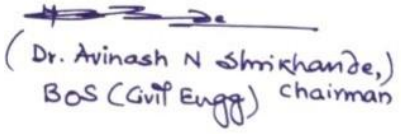
1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Design of overhead circular service reservoirs.(IS 3370-2021) Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes.(IS 1893-Part-II-2014)	**09**		**1**
	09		
Unit No.2			
Design of highway bridge with IRC loading and equivalent UDL Slab type, Two/Three girder type (IRC-06-2017)	**09**		**2**
	09		
Unit No.3			
Design of building frames up to two bay/two storey, including design of foundation. Using Limit state Method	**09**		**3**
	09		
Unit No.4			
Design of cylindrical shells by beam theory, advantages, assumptions, ranges of validity and beam analysis. Design of shells with or without edge beam. Design of Silos. (Using Limit state Method)	**09**		**4, 5**
	09		

Text Books	1.	Dr. B. C. Punmia, Arun Kumar Jain, Ashok Kumar Jain, Comprehensive RCC Design, 8th Edition, Laxmi Publication Pvt. Ltd., 2005
	2.	V. L. Shah, S. R. Karve, Illustrated Reinforced Concrete Design, 3rd Edition, Structures Publication, 1996
	3.	Advanced Reinforced Concrete Design 3ED (PB 2016) Paperback – 1 January 2016 by RAJU N.K. (Author) ,ASIN : 8123929609 ,Publisher : CBS; 3rd Revised edition (1 January 2016) ,ISBN-10 : 9788123929606
EBooks	1.	Design of Reinforced Masonry Structures, Second Edition, Narendra Taly, Ph.D., P.E., F.ASCE
	2.	Advanced Reinforced Concrete Design , by K. Raju (Author), ASIN : B07NDD1BTZ , Publisher : CBS PUBLISHERS AND DISTRIBUTORS PVT LTD; 3rd edition (30 March 2016)
Reference Books	1.	Ashok K. Jain, Reinforced Concrete: Limit State Design, 4th Edition, Nem Chand, 1993
	2.	T.R. Jagadeesh, M.A. Jayaram, Design of Bridge Structures, 2nd Edition, PHI Learning Pvt. Ltd., 2010
online TL Material	1.	https://nptel.ac.in/courses/105/105/105105105/
	2.	https://nptel.ac.in/courses/105/105/105105165/





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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: - 03	**Lecture : 3 Hours**	**Tutorial//Activity(T/A): 0Hrs**	**Practical(P): 0Hrs**
Subject Code	**BTCVE702T**	**Subject: Advance Soil Engineering (Elective-IV)**	

Examination Scheme			
Internal Marks-	**University**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5marks. for sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3Hours**

Course Objectives	
1	To understand the physical of soil and its behavior under external loads and for different site conditions.
2	To understand the Engineering properties of soil and its behavior under external loads and for different site conditions.
3	To characterize stress-strain behavior of soils, the failure criteria and to evaluate the shear strength and compressibility parameters of soils.
4	To understand the effective stress phenomenon in different types of soil.
5	To understand one dimensional and three dimensional consolidation characteristics and secondary consolidation in clays.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Estimate the amount of consolidation and settlement and time required for settlement under a given load.
2	Understand the effects of seepage on the stability of structures and calculate stresses that influence soil behavior.
3	Ability to analyze the stability of natural slopes safety and sustainability of the slopes, design of retaining structures, reinforced earth wall, etc.
4	Understand basics principles of flow and soil permeability through porous media, Construct flow nets for water flow calculations.
5	Design deep foundation systems under different loading and soil conditions.

MAPPING OF CO WITH PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	2	2	1	--	--	2	2
CO2	3	2	1	1	--	--	2	1	1	1	--	2
CO3	3	2	2	2	1	2	--	2	--	--	1	1
CO4	3	2	1	1	1	2	2	1	--	2	--	2
CO5	3	2	2	2	2	--	--	1	--	--	2	2
Avg	**3.0**	**2.0**	**1.6**	**1.4**	**1.0**	**2**	**2**	**1.2**	**1**	**1.5**	**2**	**1.8**

1 Low 2 Medium 3 High

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	**T/A**	**CO**
UNIT NO.1 Consolidation			
Compressibility and Consolidation: One dimensional compression, Oedometer test, parameters – coefficient of volume change, constrained modulus, compression index, swell or unloading, maximum past consolidation stress, Over consolidation ratio.	**03**		**1**
Primary and secondary compression, consolidation – One, two and three dimensional problems, Consolidation of partially saturated soils, Creep/Secondary Compression in soils.	**03**		**1**
	06		
UNIT NO.2 Soil strength			
Soil strength: Effective stress law for saturated and partially saturated soil, pore pressure measurements in partially saturated soils, effective stress concept, effect of intermediate principal stress.	**03**		**2**
Effect of rate of stress, stress dilatancy theory, plane strain and stress path Hvorslov shear strength parameters.	**02**		**2**
	05		
UNIT NO.3 Earth pressure			
Earth pressure – Rankine, Coulomb and Graphical Methods, Retaining walls structures.	**03**		**3**
Gravity cantilever and counter fort retaining walls: Stability checks and design.	**02**		**3**
	05		

UNIT NO.4 Liquefaction of soils			
Liquefaction mechanism, factors affecting liquefaction, liquefaction of cohesionless soils and sensitive clays, liquefaction susceptibility.	**03**		**4**
	03		
UNITNO.5 Machine Foundation			
Introduction: Types of machines, Types of machine foundations, Modes of vibrations, General requirements of machine foundation, General criteria for design, permissible amplitude	**02**		**5**
Analysis & Design of Machine foundation: Elastic homogeneous half space and lumped parameter solutions, analysis and design of foundations for reciprocating and impact type machines, turbines, effect of machine foundation on adjoining structures.	**03**		**5**
vibration isolation& control: Force isolation & motion isolation, Methods of isolation in machine foundations Isolating materials and their properties Bearing capacity of foundations: Introduction to bearing capacity of dynamically loaded foundations	**03**		**5**
	08		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2,3,4,5	Principles of Foundation Engineering	B. M Das	Thomson Brooks/Cole		Yes		
1,2,3,4,5	Foundation Analysis and Design	J. E. Bowles	McGraw-Hill Book Company		Yes		
1,2,3,4,5	Soil Mechanics	Lambe and Whitman	Wiley		Yes		
1,2,3,4,5	Soil Behaviour	James K Mitchel	John Wiley & Sons Inc		Yes		
1,2,3,4,5	Foundation of theoretical soil mechanics	M. E. Harr	Mc Graw Hill book co.				Yes

Applicable for Unit No.	Web site address
1,2,3,4,5	https://youtu.be/FEkndgIWK24
1,2,3,4,5	https://youtube.com/playlist?list=PL_ZYN7hwTiZL-FWFNAXC4F-q3zj20XROb

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
5	Indian Standard Code Of Practice For Design And Construction Of Machine Foundations.	Indian Standard	IS : 2974 (Part I) - 1982 (Reaffirmed 2008)
1,2,3,4,5	Advanced Soil Mechanics	Fifth Edition	2019

Dr. A.N. Dabhade
BOS Member

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

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

Sem: VII	**Total Hours Distribution per week**		
Total Credit:03	**Lecture (L): 03 Hrs.**	**Tutorial/Activity : - 0 Hrs.**	**Practical (P): - 0 Hrs.**
Subject Code	**BTCVE702T**	**Name of Subject: Sustainable Resource Management (Elective IV)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	Students should be able to get knowledge of natural resources and sustainability
2	Students should be able to learn about Land, Soil and Water resources
3	Students should be able to learn about the different available conventional and non conventional energy resources
4	Students should be able to learn about various available forest and mineral resources
5	Students should be able to get knowledge of Natural Resource Conservation

Course Outcome	
After completion of syllabus student able to	
1	To be able to understand the various available natural resources with their objectives, demand and Social dimensions related to the sustainability.
2	To be able to understand the various available land, soil and water resources with their objectives, impacts, renewal and management
3	To be in a position to understand various Conventional and Non-renewable Energy Resources
4	To be in a position to understand the forest and mineral resources
5	To be in a position to understand the Natural Resource Conservation system

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Natural resources & Sustainability			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to natural resources, objectives, Types of natural resources	**02**		**1**
India-general information of climate, land and soil, water resources, energy resources, agro climatic zones	**01**		
List of natural resources, Values of natural resources and Demands of Natural Resources	**01**		
Sustainability- definition, importance, environmental, economical and Social dimensions of sustainability	**01**		
Global, Regional and Local environmental issues, Insecurity of Resource Degradation, Climate Change	**02**		
	07		

Unit No.2 Land, Soil and Water resources			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction, objectives, Land resources, Land use pattern in India, Impact of land resource management, Introduction of Waste Land	**02**		**2**
Soil- Soil Profile, Soil Classification, Soil Erosion and Soil Degradation, Soil Conservation	**01**		
Water Resources, Different water resources, Hydrological cycle and its components	**02**		

Classification of water resources, Use of Water Resources, characteristics of water resources	**01**		
Supply and Renewal of Water Resource, Water Resources and Problems - The Indian Scenario	**01**		
	07		

Unit No.3 Energy Resources

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Energy Resources- Introduction, Objectives and list of Conventional and Non-renewable Energy Resources	**01**		**3**
Non-conventional forms of energy - Coal , petroleum , natural gas and lignite, resources and reserves available in India	**02**		
Renewable energy resources-Solar energy , Solar power; Wind energy, wind farms	**01**		
Geo-thermal energy ; Hydropower and micro-hydel power ; Tidal energy; Ocean.	**01**		
Thermal Energy Conversion(OTEC) Technology; Hydrogen as an alternate fuel	**02**		
	07		

Unit No.4 Forest and Mineral Resources

Details of Topic :	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to forest Resources, Forest vegetation, status and distribution, contribution as resource	**01**		**4**
Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people	**02**		
Forest products, Developing and developed world strategies for forestry	**01**		
Mineral Resources- Origin of Mineral Resources, Mineral Resource Abundance and Distribution	**02**		
The Formation of Minerals, Locating and Extracting Mineral Resources	**01**		
	07		

Unit No.5 Natural Resource Conservation

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Conservation- Introduction, Objectives, Overexploitation of Natural Resources	**01**		**5**
Degradation and Depletion of Natural Resources, Land Degradation Deforestation, Soil Erosion	**02**		
Water Pollution, Air Pollution, Need for Conservation	**01**		
Key Issues in Natural Resource Management, Land Reclamation	**01**		

Conservation of Water Resources, Energy Conservation	**02**		
	07		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
	Ecology of Natural Resources.	Francois Ramade	John Wiley & Sons Ltd.	1984	Text book		
	Managing Natural Resources-Focus on Land and Water.	Harikesh N. Mishra	PHI Lerning Publication.	2014	Text book		
	Renewable Energy Resources: Basic Principles and Application,	Tiwari, G.N. and M. K. Ghosal.	Narosa Publishing.	2005	Text Book		
	Energy & Environment: A Primer for Scientists and Engineers, Addition-	Edward H. Thorndike	Wesley Publishing Company, Reading.	1976	Text Book		
	Trees and Forest Management.	West, P.W.	Springer Publication	2004	Text Book		
	Tropical Forest Ecology: The Basis for Conservation and Management.	Montagnini, Florencia, Jordan, Carl F.	Springer Publication	2007	Text Book		
	A New Century for Natural Resources Management.	Knight, Richard L.	Island Press.	1995	Text Book		
	Water treatment and Air pollution	Dr. R.M. Dhoble, Dr. R.N.Patil, Dr. A. M. Bhamburkar	Book Rivers Publication ISBN: 978-93-5515-327-2	2022	Text Book		
	Integrated Watershed Management:	Heathcote, I.W.	Principles and Practice.John Wiley.	1988			Reference book

	Forest Ecology	James P. Kimmins	Pearson Publication.	2006			Reference Book
	Forest Mensuration	Larr, Anthonie Van, AkcaAlparslan	Springer Publication	2007			Reference Book

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
	Handbook of Natural Resource and Energy Economics Volume-3		1993
	The Handbook of Natural Resources, CRC Press; 2nd edition (10 June 2020)		2020

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE702T**	**Name of Subject: Building Construction Practices (Elective – IV)**	

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 Objective	
1	Familiarize Students with types of Construction, Building components & Building code
2	Familiarize Students with Building foundations, specification and related activities
3	Familiarize Students with Construction of sub structure related work & activities
4	Familiarize Students with Construction of super structure related work & activities
5	Understand procedure to carryout building maintainance

Course Outcome	
After completion of syllabus student able to	
1	Explain classification of Building as per NBC and building component & its function
2	Explain different types of foundations & related activities as per requirement
3.	Carryout construction of sub structure as per conditions & requirement
4.	Carryout construction of super structure as per conditions & requirement
5.	Carryout building maintenance work as per conditions & requirement

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Overview of Building components			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Classification of Buildings As per National Building Code-Part III (2005) Group A to 1 Latest code may be referred. As per Types of Constructions-Load Bearing Structure, Framed Structure, Composite Structure.	**03**		**1**
Building Components Building Components and their function. Substructure – Foundation, Plinth and Plinth Filling. Superstructure – Walls, Partition wall, cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.	**04**		**1**
	07		
Unit No.2 Building Foundation & Specification			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick – roof finishes – acoustic and fire protection;	**04**		**2**
Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork ,concrete hollow block	**03**		**2**

masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements			
	07		
Unit No.3 Construction of Sub Structure			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Sub Structure Construction- Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement	**02**		**3**
Tunnelling techniques – Piling techniques - well and caisson - sinking cofferdam	**02**		**3**
cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation	**03**		**3**
	07		
Unit No.4 Construction of Super Structure			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Super Structure Construction- Launching girders, bridge decks, off shore platforms –	**02**		**4**
special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures,	**02**		**4**
Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors –	**03**		**4**
Erection of articulated structures, braced domes and space decks; Prerequisite:	**02**		**4**
	7		
Unit No.5 Building Maintenance			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Cracks : Causes and Types of Cracks, Identification and Repair of Cracks. Grouting and Guniting.	**02**		**5**
Settlement of Foundation: Types, Causes and Remedial measures.	**02**		**5**
Demolition: Necessity, Method of Demolition- Hand Demolition, Machine	**02**		**5**

Demolition, Controlled Blasting. Demolition Implosion, Precautions During Demolition.			
Water Proofing: Necessity and importance, material used for Water Proofing, Non-conventional method of water proofing introduction of crystalline waterproofing, cement base polymer coatings, conventional waterproofing methods-brick bat coba waterproofing, Box type water proofing, Injection/grouting. Plinth Protection necessity and material used, Damp Proof Course.	**02**		**5**
	08		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1	National Building Code	BIS New Delhi					yes
1 to 2	BIS 962-1989 Code of Architectural and Building Drawing	BIS New Delhi					yes
3	BIS 1038-1983 Steel Doors. Windows and Ventilators BIS	BIS New Delhi					yes
2 to 5	Building Construction	S. P. Arora	Dhanpat Rai Publishing Co Pvt Ltd		yes		
2 to 5	Building Construction	S. C. Rangwala		25^{th}	yes		

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
1 to 5	PWD Handbooks for Materials, Masonry. Building, Plastering and Pointing	(AICTE)	
1 to 5	Practical Civil Engineering Handbook	Khanna Publication	

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE702T**	**Name of Subject: Design of Hydraulic Structures (Elective-IV)**	

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 Objective	
1	To study the fundamental concept , design and maintenance of hydraulic structures
2	To get a knowledge of various types of dam
3	Study of canal regulation, canal headwork and cross-drainage.
4	Study of design of spillway and energy dissipaters
5	To develop understanding of the basic principles and concepts of analysis and design of hydraulic structures.

Course Outcome	
After completion of syllabus student able to	
1	Understanding the design of dam section and its usefullness.
2	To know the types of canal, canal headworks, cross-drainage and canal regulator works
3	Application of the canal, dam and spillway in civil engineering structures.
4	Be able to select the type of storage works, analysis, design of various components part of diversion head works.
5	To know the concept, analysis, design and field application of various anal structures.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE702 T CO1	3	3	3	2		2						
BECVE702 T CO2	3	3	3	3	2	2						
BECVE702 T CO3	3	3	3	2	2	2	1					
BECVE702 T CO4	3	3	3	2	3	1						
BECVE702 T CO5	3	3	3	2	3	1						

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Reservoir Planning & Earthen Dam			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Reservoir Planning: Investigations, Capacities, Zones of storage, Mass Inflow and Mass Demand curves, Life of Reservoir, River training work	**02**		**1**
Earthen Dam: Nature and classification of soil, Types, causes of failure and design criteria, Description of component part of earthen dams foundation, construction methods, foundation requirements, typical earth dam sections, seepage through body of earthen dam and drainage arrangements, seepage control, Phreatic line in earth dam, Stability of foundation against shear	**05**		
	07		
Unit No.2 Gravity Dam			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Gravity dams: Defination**,** selection of site, Design Criteria, forces	**07**		**2**

acting on gravity dams, Theoretical & practical profile of gravity dam, low and high gravity dams, stability analysis, , evaluation of profile by method of zoning, foundation treatment, construction joints, galleries in gravity dams.			
	07		
Unit No.3 Spillway & Energy Dissipaters			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Spillways : Necessity, components and classification, Estimation of spillway design flood,design principle, cavitation on spillway, Ogee spillway and its design, design of outlets and rating curves, emergency spillways	**03**		**3**
Energy Dissipators: Principle, Tail water and Jump height curve, spillway gates and their design principles, Design of canal regulating structures, Design criteria for Channel transitions, Hind's method for design of transition, Design of Sarda type Falls, Design of pucca canal trough.	**04**		**3**
	07		
Unit No.4 Structures on Pervious formations			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Bligh's creep theory and limitations, Khoslas's theory of independent variable,Khosla's corrections, design of surface and subsurface weirs, Barrages :design of waterways and crest levels,design of impervious floors and protection works.	**07**		**4**
	07		
Unit No.5 Canal Structures			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**

	L	T/A	CO
Canal outlets-Review of requirements and types-modular, semi modular, non-modular outlets- design of direct sluice **Design of Cross drainage works** : Necessity,types of cross drainage works, selection of suitable type of cross drainage works, types of aqueducts, design of aqueduct, syphon,super passage and canal syphon **Design of Regulator**: Head regulator and cross regulator	**09**		**5**
	09		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
	Irrigation Engineering and Hydraulic Structures	**Santosh Kumar Garg**	khanna publication		√		
	Irrigation Engineering and Water Power Engineering	**B. C. Punmia**	**laxmi publication**		√		
	Engineering for Dams (Volumes I, II & III)	Creager, Justin & Hinds			√		
	Hydraulic Structures	Varshney			√		

	Theory & Design of Irrig. Structures	Varshney R.S.					√
	Water Resources Engineering	Sathyanarayana Murthy	Wiley Eastern		√		
	Hydraulic Structures	P. Novak	Unwin Hyman, London		√		

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
	Criteria for design of storage gravity dams	IS: 6512 (1984)	**1984**
	Design of cross drainage works – Code of Practice	IS 7784 (Part I (1993), Part II Section 1 to 5 (1995))	**1995**
	Hydraulic design of barrages and weirs – Guidelines	IS: 6966 Part I (1989)	**1989**
	Criteria for structural design of barrages and weirs	IS: 11130 (1984)	**1984**
	Criteria for design of canal head regulator	IS:6531 (1972)	**1972**
	Criteria for hydraulic design of cross regulator for canal	IS:7114(1973)	**1973**
	General requirement of canal outlets	IS:12331	

(Dr. A.N. Dabhade)
BOS Member

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

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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3Hrs**	**Tutorial/Activity(T/A): 0 hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE702T**	**Name of Subject: Advanced Traffic Engineering& Management (Elective-IV)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To introduce the students with the principles and practice of transportation engineering which focuses on traffic and transportation engineering and highway engineering.
2	To enable the students to have a strong analytical and practical knowledge of planning, designing and solving the transportation problems.
3	To introduce the recent advancements in the field of sustainable urban development, traffic engineering and management, systems dynamics approach to transport planning, highway design and construction, economic and environment evaluation of transport projects.
4	To strength the student knowledge and technical knowhow to be efficient transport engineers.

Course Outcome	
After completion of syllabus student able to	
1	Students should be able to Define and describe various traffic studies and traffic characteristics
2	Students should be able to describe terms related to highway capacity and have knowledge of statistical tools in traffic engineering
3	Students should be able to explain various theories related to traffic flow

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 11	PO 12
Subject Code &CO												
CO1	2	2										
CO2	3	2										
CO3	2	1	2									
CO4	3	3	1									
CO5	3	2	2									

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Traffic Studies & Forecast			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Traffic studies	**08**		**1**
Methods of traffic forecast			**1**
Demand relationships			
Design hourly volume			
Price-volume			
Critical hour concept			**1**
	08		
Unit No.2 Highway Capacity			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Capacity studies	**08**		**2**
Factors affecting capacity,			**2**
Level of service			
Intersections			
Mixed traffic flow			**2**
Case studies			**2**
	08		
Unit No.3 Accident Analysis			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Accidents analysis	**08**		**3**

Methods of representing accident rate			
Factors in traffic accidents			**3**
Traffic safety			**3**
Accident coefficients			
Driver strains due to roadway and traffic conditions			**3**
	08		

Unit No.4 Traffic Design			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Intersections			
Interchanges			**4**
Designs of Signals			
Traffic Rotary	**08**		
Design of Parking lot			
Parking Study			
	08		

Unit No.5			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Traffic Events: Statistical Method For Interpretation			**5**
Regression			
Application Of Binomial			
Normal And Poisson's Distributions	**08**		**5**
Continuous Distribution Of Traffic Flow			**5**
Chi-Square & 'T'test.			**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, IV&V	Transport planning and Traffic Engineering	C A O'Flaherty	Butterworth Heinemann	I	-	-	✓
I,II,III, IV&V	Introduction to Transportation Engineering	James H Bank	Tata McGraw Hill Publications	I	-	-	✓
III	Transportation Engineering an Introduction	C. Jotin Khisty	PHI Publication	I	-	-	✓

I,II,III, IV&V	Highway Engineering	Khanna S.K. and Justo C.E.G	Nem Chand & Bros	1991	✓	-	-
I,II,III, IV&V	Traffic engineering and transportation planning	L.R. Kadiyali	Khanna Publications	1987	✓	-	-

(Dr. A.N. Dabhade)
BOS Member

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

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

Sem: VII	**Total Hours Distribution per week: 3-1-0**		
Total Credit:4	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A):1 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE703T**	**Name of Subject: Advance Steel Design (Elective – V)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**4 Hours**

Course Objective	
1	Analyse the forces and stresses acting on different steel structures.
2	To understand the possible failure modes of structural members.
3	Applying various checks for strength assessment and design the member.

Course Outcome:	
After completion of syllabus student shall be able to	
1	Analyse loads acting on bridge and design of members.
2	Analyse industrial building members and their design.
3	Analyse forces acting on steel chimney and design of chimney superstructure.
4	Analyse loads acting on liquid storing tanks and their design.
5	Analyse loads actin on storage vessels and their design.

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	2	3	2			2	2	2		3
CO2	3	3	2	3	2			2	2	2		3
CO3	3	3	2	3	2			2	2	2		3
CO4	3	3	2	3	2			2	2	2		3
CO5	3	3	2	3	3			2	2	2		3

1 Low 2 Medium 3 High

SYLLABUS

Unit No :1**Design of Bridges**			
Details of Topic:	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Highway Bridge: Types of Bridges, IRC loadings, Economic span length, Impact factor, Design of deck and through type plate girder bridge.	5	1	1
Foot over Bridge:	1		1
Loading, types of decks. Design of trussed bridge	3	1	
	9	2	
Unit No: 2 : **Design of Industrial Buildings**			
Industrial sheds, Types & Design of mill bents, bracings. Design of crane and gantry girder.	5	1	2
Introduction to Pre Engineered Building	1		
Moment resisting welded and bolted connections.	3	1	
	9	2	
Unit No.:3**Design of steel Chimney**			
Types of chimney, chimney plates, linings, Breech opening, Forces acting on steel chimney. Design of self-supporting steel chimney.	6	1	3
	6	1	
Unit No:4**Design of Liquid storage steel tanks**			
Types of steel tanks, forces acting on elevated tanks, staging, wind	7	1	4

bracings. Design of rectangular, circular and pressed steel tanks.			
Design of staging.	2		
	9	1	
Unit No.:5: **Design of storage vessels**			
Design of bunkers, silos and storage bins.	8	1	5
	8	1	

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
All	Design of Steel structures	N Sbramanian	Oxford university press	First edition 2008	Text book		
All	Fundamentals of Structural Steel Design	M L Gambhir	McGraw Hill Education (India) Pvt ltd	First edition 2013	Text book		
	Design of Steel structures	S Ramamurtham	Dhanpat Rai publishijng Company	Second edition 2014			Reference book
	Design of Steel structures- Volume II	Ram Chandra	Standard Book House, Delhi	Seventh Edition 1991			Reference book
5	Design of Steel structures	S K Duggal	TataMcGraw		Text book		

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
All	Indian Standard For General Construction In Steel – Code of Practice		2007
	Steel Structural Handbook / Steel Table		

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: - 03	**Lecture : 3 Hours**	**Tutorial//Activity(T/A): 0Hrs**	**Practical(P): 0 Hrs**
Subject Code	**BTCVE703T**	**Subject: - Advance Foundation Engineering (Elective-v)**	

Examination Scheme			
Internal Marks-	**University**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5marks. for sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3Hours**

Course Objectives	
1	Design a shallow foundation subjected to eccentric & inclined loads.
2	Design of deep foundation i.e., piles based on settlement & bearing capacity criteria
3	To impart importance of raft foundation.
4	Narrate the importance of apparent earth pressure diagrams in design of sheet piles & braced cuts.
5	Design of foundations in Expansive soils.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Analyze the bearing capacity of shallow foundations;
2	Analyse and design pile foundations.
3	Evaluate the importance of raft foundation and principles of design for buildings and tower structures
4	Analyse and design Sheet piles and cofferdams.
5	Students should be able to understand the concept of foundations in expansive soils.

MAPPING OF CO WITH PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1	1	2	1	--	--	2	2
CO2	3	2	1	1	--	--	2	1	1	1	--	--
CO3	2	2	2	2	1	2	--	2	--	--	--	1
CO4	3	2	1	1	1	2	2	2	1	1	--	2
CO5	3	2	2	2	2	--	--	1	--	--	2	2
Avg	**2.8**	**2.0**	**1.6**	**1.6**	**1.25**	**1.67**	**2**	**1.4**	**1**	**1**	**2**	**1.75**

1 Low 2 Medium 3 High

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	**T/A**	**CO**
UNIT NO.1 Shallow Foundation			
Shallow Foundation: Terzaghi's bearing capacity equation, General bearing capacity equation, different bearing capacity theories, I.S. Code method, Effect of foundation shape, eccentricity and inclination of load,	**03**		**1**
Influence of soil compressibility and water table, Footing pressure for settlement on sand, Soil pressure at a depth, Boussinesq's & Westergaard methods.	**03**		**1**
	06		
UNIT NO.2 Deep foundations			
Deep foundations : Pile foundation-types, methods of installation, codal practices for permissible load under vertical and lateral loads, stresses during pile driving, load carrying capacity of pile groups, negative skin friction, under-reamed piles.	**03**		**2**
Foundation for heavy structures, well foundations, caisson foundations, equipment used for construction of these foundation systems.	**02**		**2**
	05		
UNIT NO.3 Raft Foundation			
Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.	03		3
	03		

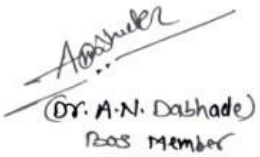
UNIT NO.4 Sheet piles & Cofferdams			
Cantilever sheet piles and anchored bulkheads: Earth pressure diagram, determination of depth of embedment in sands and clays, timbering of trenches, Earth pressure diagrams, forces in struts.	**03**		**4**
Cofferdams: Stability, bearing capacity, settlements (qualitative treatment only, no designs).	**02**		**4**
	05		
UNIT NO.5 Expansive soils			
Foundations in Expansive soils – problems in Expansive soils – Mechanism of swelling –swell pressure and swelling potential – Heave – foundation practices – Sand cushion – CNS techniqueunder–reamed pile Foundations – Granular pile – anchor technique, stabilization of expansive soils.	**04**		**5**
	4		

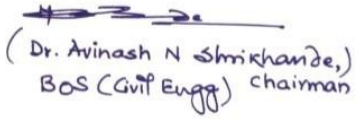
References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2,3,4,5	Principles of Foundation Engineering	B. M Das	Thomson Brooks/Cole		Yes		
1,2,3,4,5	Foundation Analysis and Design	J. E. Bowles	McGraw-Hill Book Company		Yes		
1,2,3,4,5	Soil Mechanics	Lambe and Whitman	Wiley		Yes		
1,2,3,4,5	Soil Behaviour	James K Mitchel	John Wiley & Sons Inc		Yes		
1,2,3,4,5	Foundation of theoretical soil mechanics	M. E. Harr	Mc Graw Hill book co.				Yes

Applicable for Unit No.	Web site address
1,2,3,4,5	https://youtu.be/lsYFtwwlHIw
1,2,3,4,5	https://youtu.be/RmE4fgElekA

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
4	Indian Standard Criteria For Design Of Diversion Works, Part I, Coffer Dams.	Indian Standard	December 1982
5	Indian Standard Methods Of Test For Soils, Part Xli, Measurement Of Swelling Pressure Of Soils,	Fifth Edition	May 1978





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FACULTY OF SCIENCE & TECHNOLOGY

B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 03 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE703T**	**Name of Subject: Air Pollution & Solid Waste Management (Elective-V)**	

Examination Scheme			
Internal Marks:	**Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objectives:

1.	The course will provide students knowledge regarding different aspects of air pollutants, its sources and effects, meteorological parameters, air sampling
2.	The course will prepare students to design equipments for air pollution to reduce its impact on environment
3	The course will provide students the knowledge regarding problems arriving in handling large amount of solid waste generated, its collection, transportation, and processing
4	The course will prepare students to learn emerging technologies for air pollution control, design safe collection and disposal methods.

Course Outcomes:

1.	Students will be able to understand different aspects of air pollutants, its sources and effects on man & materials and Meteorological parameters
2.	Students will be able to understand methods of air sampling & design equipments for air pollution to reduce its impact on environment
3	Students will be able to understand problems arriving in handling large amount of solid waste generated
4	Students will be able to understand problems arriving in its collection, transportation, and processing & to design safe collection and disposal methods
5	Students will be able to learn emerging technologies for air pollution control.

MAPPING OF CO WITH PO

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	1	2				2	3					
CO2		1	3			2	3	2				1
CO3	2					3	3					1
CO4		1				3	3					1
CO5			3			3	3					1

1. Low 2. Medium 3. High

UNIT-I (07 Hrs.)

Introduction to air pollution: Definition, atmosphere & its zones, Classification and sources of air pollutants, Impacts of air pollution on human health, vegetation, animals, building materials, structures, and atmosphere, soil and water bodies, Global and regional environmental issues of air pollution: Ozone depletion, Climate change, Global warming, Acid rain.

Meteorological parameters: Primary and secondary parameters, atmospheric stability, plume behaviour. Wind rose diagram, Air Quality Index (AQI), Standards for air pollution (as per Indian Standards and CPHEEO),

UNIT-II (08 Hrs.)

Air sampling and measurement: Ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, (adsorption, absorption, incineration, condensation), site selection criteria, methods of estimation. Stack height determination

Air pollution controls methods and equipments: Principles of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters, cyclones and wet scrubbers

UNIT-III (07 Hrs)

Introduction to solid waste management(SWM): Structure , necessity and responsibility, Sources, Quantity and quality, Sources of solid waste, classification and components, physical and chemical characteristics, per capita contribution, sampling and analysis

Collection and transportation of solid waste: Method of collection, equipment used for collection and transportation, transfer stations, optimization of transport route.

UNIT-IV (07 Hrs)

Solid waste processing: Methods of processing, merits and demerits of various methods, 3R concept

Disposal methods: Composting of waste, methods of composting, factors affecting composting Sanitary land filling: Site requirements, methods, leachate management

UNIT –V (07 Hrs)

Incineration: Principles of incineration, types of incinerators, advantages and disadvantages, Pyrolysis, Gasification, Refuse derived fuel(RDF), Biogas

Control of gases: Carbon Footprint, Emerging technologies and strategies to mitigate air pollution, Current challenges and way forward

REFERENCE BOOKS:

1. M.N. Rao & H.V.N.Rao, " Air Pollution", Tata McGraw Hill Publishing Co. Ltd.

2. C.S.Rao, "Environmental Pollution Control Engineering", Wiley Estern Ltd. New Delhi.

3. Gurjar, B.R., Molina, L., Ojha, C.S.P. (Eds.), "Air Pollution: Health and Environmental Impacts", CRC Press. 2010.

4. A. D. Bhide, & Sunderesan B.B., "Solid Waste Management in developing countries, INSDOC, N. Delhi

5. Treatment and Disposal of Solid and Hazardous Wastes Kindle Edition by Debashish Sengupta, Brajesh K. Dubey, Sudha Goel

6. Solid and Hazardous Waste Management, Second Edition by M. N. Rao

7. Municipal Solid Waste Management by P Jayarama Reddy

8. Municipal solid waste management rules Handbook

(Dr. A.N. Dabhade)
BoS Member

(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: VII	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 0 Hrs**	**Practical (P): 0 Hrs**
Subject Code	**BTCVE703T**	**Name of Subject: Precast and Modular Construction Practices (Elective-V)**	

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 Objective	
1	To understand the design principles related to prefabrication elements.
2	To obtain knowledge on the concepts of production, transportation, assembling & erection of precast buildings
3	To understand behaviour of structural components and joints.
4	To obtain knowledge of different equipment of precast construction practices.
5	To study different loads on the structural components.

Course Outcome	
After completion of syllabus student able to	
1.	Give knowledge of factors to be considered in the design of prestressed concrete structures
2.	Give knowledge of the design and manufacturing of Finnish precast concrete products
3.	Understand the difference between pre- and post-tensioned systems for structural behaviour
4.	Learn to consider specific features of precast concrete structures: connections, stability and prevention of progressive collapse, ductility
5.	Learn to consider the influence of time-dependency of materials on structural reliability.

MAPPING OF CO WITH PO

CO/PO	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO1 1	PO1 2
1	2	3	2	-	-	1	1	1	1	-	-	2
2	2	2	2	2	-	1	1	1	1	1	2	2
3	3	3	2	2	1	1	1	1	2	1	1	2
4	3	3	2	1	-	1	1		-		-	2
5	1	2	2	-	-	-		-	-	-	-	2
Avg	2.2	2.6	2.0 0	1.00	0.2	0.8	0.8	0.75	1	0.5	0.75	2.00

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
History of Precast Concrete, Materials, Typical framing, Standard components, Structural behaviour of precast structures - Specific requirements for planning and layout of prefabrication plant - IS Code specifications.	**05**		**1**
economy of prefabrication, modular coordination, standardization – Materials – Modular coordination – Systems – Production – Transportation – Erection.	**03**		**1**
	08		

Unit No.2

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Application of prestressing of roof members; floor systems two-way load bearing slabs, pre-stressed beam, Precast column -precast shear walls, Wall panels, hipped plate and shell structures.	**07**		**2**
	07		

Unit No.3			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.	**03**		**3**
Joints - Joints for different structural connections, effective sealing of joints for water proofing, provisions for non-structural fastenings, expansion joints in precast construction.	**05**		**3**
	08		
Unit No.4			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Production Technology - Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening. Hoisting Technology - Equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads.	**07**		**4**
	07		
Unit No.5			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.	**07**		**5**
	07		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1	Composite steel and concrete Construction.	P.R Knowels,	Butterworth, London. 1971				
2	Knowledge based process planning for construction and manufacturing.	Gerostiza C.Z., Hendrikson C. and Rehat D.R.,	Academic Press Inc., 1994				
3,4	Text Book of Precast Concrete Structures	KimS. Elliot (2017)	CRC Press				

	Composite Structures of steel and concrete	R.P.Johnson & R.J.buckby	Granada Publishing LTd. 1979.				
	Precast Concrete Design and Application	A.M.Hass	Applied Science Publishers London 1983.				
	Plan Cast Precast and Prestressed concrete(A Design Guide)	Devid A.Sheppard & William R. Phillps	Mcgraw Hill Publication Co. 1989.				
	Manual of precast concrete construction, Vols. I, II and III,	Koncz T	Bauverlag, GMBH, 1971.				
5	Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland,	Betor Verlag	1978.				
	Prefabricated Concrete for Industrial and Public Structures	Mokk. L, (1964),	Publishing House of the Hungarian Academy of Sciences, Budapest.				
	Prefab Architecture: A Guide to Modular Design and Construction,	Ryan E. Smith, (2010),	John Wiley and Sons, London.				
	Precast Concrete Structures,	Hubert Bachmann and Alfred Steinle, (2011),	Wiley VCH.				

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
	Handbook of Precast Concrete Buildings (2016) ICI publications.		2016
	CBRI, Building materials and components, India, 1990		1990

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3 Hrs.**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE703T**	**Name of Subject: Hydropower Engineering (Elective-V)**	

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 Objective	
1	To impart the knowledge for understanding of various aspects of hydropower development
2	Demonstrate the ability to apply knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes
3	Understand the design of hydro power plant
4	Understand various types of Civil Engineering structures used in hydropower development and design aspects
5	Knowledge about electrical aspects of power unit and understand the importance of these items.

Course Outcome	
After completion of syllabus student able to	
1	To understand about the sources of water power and estimation of its potential
2	To learn the concept, design, investigation of power canals and its components
3	To understand the concept, design, investigation about various parts of power units.
4	To understand the concept, investigation about various parts of a power house.
5	To impart the knowledge about electrical aspects of power unit and understand the importance of these items.

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE703 T CO1	3	3	3	2	1	2	2					
BECVE703 T CO2	3	3	3	3	1	2	2					
BECVE703 T CO3	3	3	3	3	2	2	1					
BECVE703 T CO4		3	3	3	2	2						
BECVE703 T CO5	3	3	3	2	2	2						

1 Low 2 Medium 3 High

SYLLABUS

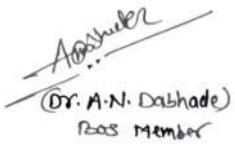
Unit No.1 Introduction			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
sources of energy, importance of water power, Hydropower development, Estimation of water power potential	**03**		**1**
Types of hydro power plant : classification of hydel plants, Run of river plants, General Arrangements of Run of River Plants, Valley Dam plants, Diversion Canal Plants, High Head diversion plants, Storage and pondage, Tidal power plant - Recent experiences in wave power development.	**03**		**1**
Pumped storage power plants, Small and mini Hydropower systems - Power demand, general description of layout; topographic requirements of each above.	**02**		**1**
	08		

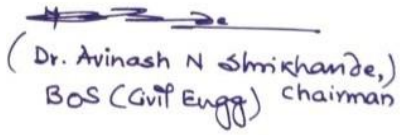
Unit No.2 Water Conveyance System &Penstock			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Power Canals, Alignment, Design criteria for Power canals, Flumes, Covered conduits and Tunnels	**03**		**2**
Penstocks: general classification; design criterion; economical diameter; Anchor blocks, Conduit valves, Bends and manifolds.	**05**		**2**
	08		
Unit No.3 Water Hammer & Surge Tank			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Water hammer: Introduction, Transients caused by turbine, Load acceptance and rejection,equation for uniform diameter penstock, use of Allievi's chart.	**03**		**3**
Surge tanks: types; functions; locations; hydraulic design & stability of surge tanks**,** Channel Surges	**05**		**3**
	08		
Unit No.4 Intake			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Intakes: Types, locations, losses**,** trash & other components, control gates, emergency gates, canal forebay, general principles of alignment and balancing tank.	**03**		**4**
Turbines : types,general description and layouts, specific speed, Basic flow equations, characteristics of turbines	**03**		**4**
	06		

Unit No.5 Power House			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Power houses: types, general layouts and approximate dimensions.	**03**		**5**
Electrical Load on Hydro Turbines : Load Curve, load Factor, Capacity Factor, utilization factor, Diversity Factor, load Duration Curve	**04**		**5**
	07		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
	Water Power Engineering	Barrows H.K.	Tata McGraw Hill Publishing Company Ltd		√		
	Hydropower Structures	Varshney, R.S.	Nem Chand Brothers		√		
	Water Power Engineering	Sharma, Dandekar M.M.	Vikas Publishing House, Gaziabad,		√		
	Handbook of Hydroelectric Engineering	Nigam P.S.	Nem Chand & Brothers, India				√
	Hydro electric Hand Book	Creager and Justin	John Wiley				√
	Irrigation water power and Water	Arora, K.R.	Standard Publishers Distributors,		√		

	Resources Engineering		Delhi				
	Water Power Engineering	Sharma R.K. & Sharma T.K	S. Chand Publication		√		
	Hydraulic Transient	Streeter V. L. & Wylie E. B	McGraw Hill Book Company, New York		√		
	Water power engineering	Deshmukh M.M	Dhanpat Rai New Delhi		√		





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

Sem: VII	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 3/0 hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE703T**	**Name of Subject: Bridge Engineering (Elective-V)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	Students should be able to choose the appropriate bridge type for a given project, and to analyses and design the main components of the chosen bridge.
2	To help the student develop an intuitive feeling about the sizing of bridge elements, ie. develop a clear understanding of conceptual design.
3	To understand the load flow mechanism and identify loads on bridges.
4	To develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality
5	Student should know about various types of loads on the bridges.

Course Outcome	
After completion of syllabus student able to	
1	To analyze the functional utility of bridges and their components.
2	To determine the forces acting on bridges and to calculate bending moment, shear force etc.
3	To understand the behaviour of components of bridge due to load and able to design it for safety and serviceability.
4	To understand the support conditions, the functional utility and use of bearings.

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 11	PO 12
Subject Code &CO												
CO1	3	3										
CO2	3	2										
CO3	2	3	2									
CO4	3	3	1	2								
CO5	3	2	2	1								

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Bridges			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Bridge	**08**		**1**
Types of bridges			**1**
Different Component of bridge			**1**
functions of Bridge component			
IRC Loading			
Loading Standards			**1**
	08		

Unit No.2 Bridge Girder			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Design of Balanced Cantilever Bridge	**08**		**2**
Design of Balanced Cable Stayed Bridge			**2**
Introduction, Types of Girder			
Design of Bow String Girder Bridge			
	08		

Unit No.3 Pre-stressed Concrete Bridge			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Design of pre-stressed concrete girder	**08**		**3**
box girder bridges			
box girder bridges considering only primary torsion			**3**
Design of end block			**3**
	08		

Unit No.4 Component of Bridges			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Piers	**08**		
Abutments			**4**
Wing walls factors effecting and stability			
Bridge Bearing			
Types of bearings			
Elastomeric bearing			
	08		
Unit No.5 Bridge Foundation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Well foundations	**08**		**5**
Design and construction of well			
Open well, sinking of walls			
Plugging			**5**
Sand filling and casting of well cap			**5**
	08		

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, IV&V	Bridge Engineering	S.Ponnuswamy	TataMcGraw-Hill, 1986.	I	✓	-	
I,II,III, IV&V	Bridge superstructure	N.Rajagopalan	Narosa Publishing House, 2006	I	✓	-	
III	Essentials of Bridge Engineering	Victor, D.J.	Oxford & IBH Publishers Co., New Delhi,1980	I		-	✓

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VII	**Total Hours Distribution per week 3-0-0**		
Total Credit:03	**Lecture (L): 03Hrs**	**Tutorial/Activity (T/A):00 Hrs.**	**Practical (P): 00 Hrs.**
Subject Code	**BTCVE704T**	**Name of Subject: Design of Earthquake Resistant Structure (Elective-VI)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(15 Marks for sessional examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To provide a coherent development to the students for the courses in sector of earthquake engineering
2	To design earthquake resistant structures as per IS 1893
3	To present the foundations of many basic engineering concepts related earthquake Engineering
4	To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

Course Outcome	
After completion of syllabus student able to	
1	Understand the philosophy of earthquake resistant design.
2	Understand the concept of various effects on structure due to earthquake.
3	Evaluate seismic forces for various structures as per relevant Indian standards
4	Design and ductile detailing of structures for seismic resistance as per Indian standards
5	Apply the concepts of repair and rehabilitation of earthquake affected structures

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Subject Code & CO NO.												
CO1	3	3	3	3	-	-	-	-	-	2	-	3
CO2	3	3	3	3	-	-	-	-	-	2	-	3
CO3	3	3	3	3	-	-	-	-	-	2	-	3
CO4	3	3	3	3	-	-	-	-	-	2	-	3
CO5	3	3	3	3	-	-	-	-	-	2	-	3
Avg CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**

1 Low 2 Medium 3 High

SYLLABUS

Unit -I			
Engineering seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate, Seismic waves. Seismic intensity, Richter scale, Introduction on to tsunami. Seismic zoning maps of India , Response spectra. Strong motion characteristics.	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
	06		**1**
Unit -II			
Earthquake effects on the structures, combination of loads, Seismic damages during past earthquakes, Effect of irregularities and building architecture on the performance of RC structures	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
	06		**2**
Unit -III			
Seismic methods of analysis, seismic design methods, Mathematical modelling of multi-storeyed RC buildings with modelling of floor diaphragms	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
	06		**3**
Unit -IV			
Design of multi – story RC structure foundation as per latest (IS 1893-2016) by Equivalent static lateral load method and Response spectrum Method, Introduction to Time history method. Concept of Capacity based design of soft story RC building. Concept of shear walls. Ductile detailing as per latest IS :13920-2016	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
	10		**CO4**
Unit -V			
Seismic retrofitting, Source of weakness in RC framed building,	**Allotment of Hours**		**Mapped with CO Number**

Various retrofitting techniques, case studies. Introduction to Base Isolation system. IS code provision for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques	L	T/A	CO
	08		5

References							
Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
V	Design of Seismic Isolated Structures	FarzadNaeim, James M. Kelly		2007			
IV	Dynamics of Structures: Theory and Applications to Earthquake Engineering	A K. Chopra	Prentice-Hall of India	3RD			
IV	Dynamics of Structures	A K. Chopra	Pearson	2007			
ALL	Earthquake Resistant Design of Structures	PankajAgarwal and Manish Shrikhande	Prentice Hall India,	2006			

List of Code/Handbook			
Applicable for Unit No.	Title of Code	Type of code	Year of Publication
II,III,IV	IS-1893 CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES PART 1 GENERAL PROVISIONS AND BUILDINGS (Fifth & Sixth Revision)		2016
IV	IS-13920 DUCTILE DETAILING OF REINFORCED CONCRETE STRUCTURES SU'BJECTEDTO SEISMIC FORCES - CODE OF PRACTICE		2016

Applicable for Unit No.	Website address
All	NICEE (National Information Centre for Earthquake Engineering) IITK https://www.nicee.org/

(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: VII	**Total Hours Distribution per week**		
Total Credit: - 03	**Lecture : 3 Hours**	**Tutorial//Activity(T/A): 0Hrs**	**Practical(P): 0Hrs**
Subject Code	**BTCVE704T**	**Advance Engineering Geology (ELECTIVE-VI)**	

Examination Scheme			
Internal Marks-	**University**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (l5marks. for sessional Examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3Hours**

Course Objectives	
1	To study principles of geology applicable for tunnel and underground openings.
2	To analyze the engineering behavior of rock in underground excavations.
3	To develop interpretation skills for underground projects.
4	Confident in problem solving related to engineering behavior of the subsurface.
5	Effective technical communication, Forecasting, Calculated risk taking.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply engineering geological concepts and approaches on rock engineering projects.
2	Explain soil profile, geo-hydrological characters of various rock formations and necessity of geological studies in water conservation.
3	Synthesize and Interpret the geologic data to establish the geological framework needed for design and construction of underground openings
4	Validate the suitability of rocks based on mechanical properties, R.Q.D. and geophysical exploration
5	Illustrate the suitability of proposed alignments for tunnels and bridges on the basis of Geological investigations.

MAPPING OF CO WITH PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	1	2	1	--	--	2	2
CO2	3	2	1	1	--	--	2	1	1	1	--	--
CO3	3	2	2	2	1	2	--	2	--	--	--	--
CO4	3	2	1	1	--	--	2	2	--	1	2	2
CO5	3	2	2	2	2	--	--	1	--	--	2	2
Avg	**3**	**2.0**	**1.6**	**1.4**	**1.33**	**1**	**2**	**1.4**	**1**	**1**	**2**	**2**

1 Low 2 Medium 3 High

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	**T/A**	**CO**
UNIT NO.1 Engineering Geology In Theory And Practice			
Engineering Geology In Theory And Practice: Influence of various minerals on the engineering behavior of rocks, role of structural geology, geomorphology and stratigraphy in deciding alignment of the tunnels.	**03**		**1**
Engineering Geological Interpretation of Laboratory and In-Situ Tests Rocks :Physical properties, Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: In situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.	**03**		**1**
	06		
UNIT NO.2 Soil Profile of India			
Geological process of soil formations: rock weathering conditions favorable for decomposition, disintegration, effect of climate on formation of soil, soil profile of various states in India, residual and transported soils, various water conservation techniques.	**03**		**2**
Effect of over exploitation of tube wells, bore wells and dug wells, artificial recharge, rainwater harvesting, watershed development and necessity of geological studies, relevant case studies highlighting the success and failure of these techniques.	**03**		**2**
	06		

UNIT NO.3 Engineering Geological Investigation for Tunnels or underground openings			
Engineering Geological Investigation for Tunnels or underground openings: Stability of portal sections; evaluation of tunnel alignment.	**03**		**3**
Choice of method of tunneling depending on the geological framework. Problems in underground openings of coastal area.	**03**		**3**
	06		
UNIT NO.4 Geophysical Explorations and Rock Mechanics			
Geophysical explorations: various methods of geophysical explorations, evaluation and analysis of the data produced during these methods, application of these methods in civil engineering projects.	**03**		**4**
Rock mechanics: general principles of rock mechanics, dependence of physical and mechanical properties of rocks on geological characters, analyzing and evaluating of core recovery.	**03**		**4**
	06		
UNITNO.5 Engineering Geological Exploration			
Geological exploration for tunnels: variations in methodology of investigation for different types of tunnels for different purposes, location, spacing, angles and depths of drill holes suitable for different types of tunnels, difficulties introduced in various geological formation and their unfavorable field characters, stand up time of rock masses and limitations of it.	**03**		**5**
Dependence of protective measures such as guniting, rock bolting, shotcreting, steel fiber shotcreting, permanent steel supports, lagging concreting and grouting above permanent steel supports on geological conditions, illustrative case studies. Bridges: investigation for bridge foundation, special techniques, and objectives of investigation for bridge foundation, bridge foundation based on nature & structure of rock, foundation settlements.	**03**		**5**
	06		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1,2,3,4,5	Engineering Geology	Subinoy Gangopadhyay	Oxford University Press.		Yes		
1,2,3,4,5	Introduction to	B. P. Verma	Khanna Pub		Yes		

	Rock Mechanics,		New Delhi					
1,2,3,4,5	Fundamentals of Rock Mechanics	Jaeger J. C., Cook N. and Zimmerman R	Blackwell Scientific Publications					Yes
1,2,3,4,5	Introduction to Rock Mechanics	Goodman R. E	John Wiley & Sons					Yes
1,2,3,4,5	Tunnels: Planning, Design, Construction	T. M. Megaw and J. V. Bartlett	Ellis Horwood ltd. John Willey & Sons.					Yes

Applicable for Unit No.	Web site address
1,2,3,4,5	https://youtu.be/aTVDiRtRook
1,2,3,4,5	https://youtu.be/yodHMzUx2V4

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
1, 2	Glossary of items relating to river valley projects: Part 7 Engineering Geology (First Revision).	Indian Standard	2020, Feb
4	Indian Standard Glossary of terms and Symbols Relating to rock Mechanics.	Fifth Edition	Nov, 1998

(Dr. A.N. Dabhade)
BoS Member

(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: VII	**Total Hours Distribution per week**		
Total Credit:03	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs**	**Practical (P): 0 Hrs**
Subject Code	**BTCVE704T**	**Name of Subject: Water & Wastewater Treatment (Elective-VI)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	The course will provide students' knowledge regarding the different sources of water & waste water, characteristics, available treatment technologies and designs
2	The course will make students able to design and implement the different water and wastewater treatment units
3	The course will provide students the knowledge regarding real problems finding and handling strategies of water and wastewater treatments.
4	The course will prepare students to learn recent and advanced treatments of water and wastewater and disposals methods.

Course Outcome	
After completion of syllabus student able to	
1	Understand the process and design components of water treatment such as Aeration, coagulation-flocculation and Sedimentation
2	Understand the process and design the components of water treatment such as Filtration, Disinfection
3	Understand the various sources characteristics and disposal methods of wastewater
4	Understand and design the different preliminary and primary waste-water treatment
5	Understand and design the different Secondary waste-water treatment

MAPPING OF CO WITH PO

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

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 Introduction to WTP & Aeration, Coagulation- flocculation & Sedimentation			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to Water Treatment: Objective of water treatment, unit operation and unit processes, treatment flow sheet, site selection for water treatment plant	**01**		**1**
Aeration: objective of aeration, types or aerators,	**01**		
Design of cascade aerator, gas transfer, two film theory	**01**		
Coagulation- Flocculation: Theory of coagulation objectives, types & factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids	**01**		
Design of rapid and slow mixing devices (hydraulic and mechanical),	**01**		
Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling,	**01**		
Design of sedimentation tank and clariflocculators	**01**		
	07		
Unit No.2 Filtration, Disinfection &Minor methods			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Filtration: mechanism of filtration, types of filters	**01**		**2**
Design of rapid sand filters, filter media specifications,	**01**		
Preparation of filter sand from stock sand, problems in filtration.	**01**		
Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants,	**01**		

chlorination, method of chlorination (breakpoint chlorination), factors affecting efficiency of chlorination	**01**		2
Iron and manganese removal, de-fluorination.	**01**		
Recent development in water treatment	**01**		
	07		

Unit No.3 Characteristics & Disposal of Waste water

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to waste water Sources, Physical and chemical characteristics of waste water	**02**		**3**
DO, BOD, COD, determination of BOD rate constant, Problems on DO and BOD	**03**		
Disposal of sewage by dilution and by land disposal, Streater-Phelps's equation. Numerical	**02**		
	07		

Unit No.4 Preliminary & Primary Waste water Treatment

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Treatment Methods: Waste water treatment flow sheet, preliminary & primary	**02**		**4**
secondary methods of treatment,	**02**		
Design of screen, Girt chamber and primary settling tank.	**03**		
	07		

Unit No.5 Secondary Treatments

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process, aerated lagoons and stabilization ponds.	**03**		**5**
Design of ASP, Sludge treatment, aerobic and anaerobic digestion, reactor types (such as UASB, AFFB, Hybrid reactor) & factors affecting anaerobic digestion and sludge drying beds (excluding design)	**03**		
	06		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1	"Waste Water Treatment for Pollution Control and Reuse".	Sali J. Arcelvala	Tata Mcgraw Hill	**2008**			**Text Book**
2	Water Supply Engineering Environmental Engineering Vol.-I	Dr. P.N. Modi	Standard Publication	**2018 6th edition**	**Text Book**		
3	Water Supply Engineering Environmental Engineering Vol.-II	Dr. P.N. Modi	Standard Publication	**2018 6th edition**	**Text Book**		
4	Design of Water Treatment Plant	Dr. A.G. Bhole	IWWA, Nagpur centre	**2008**		**Research Article**	
5	Environmental Engineering Vol- I & II	Dr. B.C. Punmia	Laxmi Publication	**2005**			**Reference book**
6	Water and Waste Water Treatment, Disposal And reuse	Metcalf and Eddy	Tata McGraw Hill. 6	**2017 (Third edition)**			**Reference book**

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
I, II	CPHEEO Manual on Water Supply and Treatment	**CPHEEO Manual**	**2009**
II, IV, V	Manual on Sewerage and Sewage Treatment Systems - 2013	**CPHEEO Manual**	**2013**

Applicable for Unit No.	Website address
I, II	**https://jalshakti-ddws.gov.in/cpheeo-manual-water-supply-and-treatment**
II, IV, V	**http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php**

(Dr. A.N. Dabhade)
BOS Member

(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: VII	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture : 3 Hours**	**Tutorial//Activity (T/A): 0Hrs**	**Practical (P): 0Hrs**
Subject Code	**BTCVE704T**	**Subject:- Forensic In Civil Engineering (Elective-VI)**	

Examination Scheme			
Internal Marks-	**University**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks **(l5marks. for sessional Examination)** **(15 Marks for Activity based)**	**70 Marks**	**45 Marks**	**3 Hrs**

Course Objectives	
1	To impart knowledge of various testing methods of Failed Structures.
2	To learn about aspects of failures connected with various structural systems and materials.
3	To impart knowledge about foundation failures.
4	To know about strategic measures against failures
5	To gain insight into previous structural failures.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand various testing methods of Failed Structures.
2	Understand the aspects of failures connected with various structural systems and materials.
3	Plan the strategic measures against failures.
4	Can write the legal and technical report of the failure in lucid manner.
5	To impart knowledge about structural failures

MAPPING OF CO WITH PO

CO/ P0	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

SYLLABUS

Details of Topic	**Allotmentof Hours**		**Mapped with CO Number**
	L	**T/A**	**co**
UNIT NO.1			
Introduction to forensic engineering, Forensic investigations-tools and techniques.	**03**		**1**
Scope and extent of application of Forensic Engineering techniques in various fields of Civil Engineering.	**04**		**1**
	07		
UNIT NO.2			
Structural Failures: Failure of construction materials steel, concrete - Joints by Bolt and weld. Failure of compression members and tension members by reversal of loads	**04**		**2**
Failure aspects of post tensioned concrete systems, space frame, plane frame, precast buildings, failure of bridges.	**02**		**2**
Geo-Technical Failures: Soil liquefaction, failure of foundation systems – Causes and prevention	**02**		**2**
	08		

UNIT NO.3			
Testing of failures: Various methods of testing of failed structures & instrumentation- Laser scanning, microscope, Radio graphic evaluation, Load Testing of shoring systems and repair technology	**03**		**3**
Back analysis: Selection of theoretical model - methods of analysis, Instrumentation and Monitoring. Development of the most probable failure hypothesis - cross-check with original design	**04**		**3**
	07		
UNIT NO.4			
Designing Against Failure: Quality control – Material selection, workmanship, design and detailing	**04**		**4**
Performing reliability checks, Legal issues involving jurisprudence system, insurance, reducing potential liability, responsibility of engineers and contractors. Professional practice and ethics.	**03**		**4**
	07		
UNIT NO.5			
Case Studies on famous failures – Reasons and lessons learnt	**04**		**5**
Aspects of professional practice. Forensic analysis of R.C.frames	**03**		**5**
	07		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
1&2	Guidelines for Forensic Engineering Practice	Gary L Lewis	ASCE Publication		**Text Book**		
3	Introduction to Forensic Engineering	Randall K Noon	CRC Press		**Text Book**		
4&5	Forensic Engineering	Sam Brown	ISI Publication		**Text Book**		

Curtes of Bhonde

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

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

Sem: VII	**Total Hours Distribution per week**		
Total Credit:	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE704T**	**Name of Subject: Irrigation Management (Elective-VI)**	

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 Objective	
1	To Learn basic principles of irrigation management
2	To impart the knowledge of various irrigation efficient and effective methods
3	To know the efficient irrigation and water management to maximise crop yield
4	To discuss the importance of participation of irrigation stake holders
5	To know various rules and regulations, various water laws

Course Outcome	
After completion of syllabus student able to	
1	Discussion of various principles of irrigation management
2	Study of various methods of canal section design and approaches of optimal canal design
3	Estimation of seepage losses through a canal system and criteria to minimise it
4	Involvement of various stake holders of irrigation system and efficient functioning for the better efficiency of the system
5	Knowing various policies and attempt made by state and central Government for the proper functioning of irrigation system

MAPPING OF CO WITH PO

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BECVE704T CO1	2	2	3	1	1	2						
BECVE704T CO2	3	3	3	1	2	2						
BECVE704T CO3	2	3	3	3	3	3						
BECVE704T CO4		2	2	1	1	2	1		3	2		
BECVE704T CO5		3	3	2	1	3	1	1	3			

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1			
Importance of Irrigation	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Goal and importance of irrigation management, various methods of irrigation, water use efficiencies, water charges, measurement of depth of irrigation, cropping pattern, crop rotation, conjunctive use	**08**		**1**
	08		
Unit No.2			
Canal Irrigation	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Types of canal, optimal canal design, an efficient canal network, maintenance of canal system, balancing canal section, methods of canal design and concept of command Area development authority	**08**		**2**
	08		
Unit No.3			
Water Losses	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Canal losses, measurement of canal losses, minimising the canal losses, canal lining, economic s of canal lining, concept of night irrigation	**08**		**3**
Unit No.4			
Involvement of stake holders	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Former participation water uses societies, participatory irrigation	**08**		**4**

management, training to the water users, role of engineers in irrigation system			
	08		
Unit No.5			
Irrigation Policies	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Irrigation policies and institution, present state of irrigation policies; water dispute, inter-state river water dispute, concept of inter linking of rivers and discuss their feasibilities	**08**		**5**
	08		

References

Applicable for Unit No.	Name of Book	Name of Author	Name of Publisher	Edition	Category		
					Text Book	Research paper	Reference book
	Water Management	D.K.Mujumdar	Prentic Hall of India Learning Pvt. Ltd, New Delhi	2013	Yes		
	Efficient use of Irrigation Water	G.H.Sankar Reddy and Y. Reddy	Kalyani Publishers, Ludhiana	2006	Yes		
	Irrigation Theory and practice	A.M.Michael	Vikas Publishing House Pvt. Ltd, New Delhi	2006	Yes		
	Hand Book - Irrigation System Operation Practice, Water Resources Management and training project,	CWC Publication Technical Report No.33	CWC, New Delhi	1990	Yes		
	Managing Irrigation . Together Practices and Policy in India	Maloney C. And Raju K.V.	Stage Publication, New Delhi, India	1994	Yes		

(Dr. A.N. Dabhade) BOS Member

(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: VII	**Total Hours Distribution per week**		
Total Credit: 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): 0 hrs.**	**Practical (P): 0 Hrs.**
Subject Code	**BTCVE704T**	**Name of Subject: Pavement Analysis & Design (Elective-VI)**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
30 Marks (15 Marks for sessional examination) (15 Marks for Activity based)	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	The student can understand, analyze, apply and evaluate various parameters required in the design of flexible and rigid pavement of highway and airfield pavements.
2	They can analyze, apply and evaluate the analysis of flexible and rigid of highway and airfield pavements.
3	They can analyze, apply and evaluate the design of flexible and rigid of highway and airfield pavements.
4	They will be able to conduct field tests and can analyze, apply and evaluate the design strengthening of pavements.

Course Outcome	
After completion of syllabus student able to	
1	Analyze the stresses and strains in a flexible pavement using multi-layered elastic theory.
2	Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
3	Analyze stresses and strains in a rigid pavement using Westergaard's theory.
4	Design a rigid pavement using IRC, and AASHTO methods.
5	Comprehend the concept of strengthening of existing pavements and pavement management system

MAPPING OF CO WITH PO

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 11	PO 12
Subject Code &CO												
CO1	2	2										
CO2	3	2										
CO3	2	1	2									
CO4	3	3	1									
CO5	3	2	2									

1 Low **2 Medium** **3 High**

SYLLABUS

Unit No.1			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
General: Types and component parts of pavements	**08**		**1**
Factors affecting design and performance of pavements.			**1**
Design parameters: Design wheel load, Standard axle load and wheel assemblies for road vehicles			
Under carriage system of aircraft. Tyre and contact pressure, contact area, imprints, computation of			
ESWL for flexible and rigid pavements. ESWL of multiple wheels, repeated loads and EWL factors.			
Pavement behaviour under transient traffic loads. airport traffic areas, Serviceability concept.			**1**
	08		

Unit No.2			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Analysis of flexible pavement : stress, strain,	**08**		**2**
Deflection analysis one layer system by boussinesq's.			**2**
Burmister's two layer theory, three layer			
Multi-layer theories, wheel load stresses,			
Layer equivalent concepts, stress and deflections for rigid pavements due to load and temperature, influence charts			**2**

Analysis of rigid pavement : wheel load stresses, warping stresses, frictional stresses, combined stresses.			**2**
	08		

Unit No.3			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Design using the latest IRC code (Flexible Pavement)	**08**		**3**
Design using the latest IRC code (Rigid Pavement)			
AASHTO method of design.			**3**
	08		

Unit No.4			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction & function of rigid pavement	**08**		
Highway rigid pavement design			**4**
Design of cc pavement for roads			
Runways as per IRC latest code,			
Design of joint details for longitudinal joints, contraction joints and expansion joints,			
PCA and, aashto methods.			
	08		

Unit No.5			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Pavement testing and evaluation: pavement failures in both flexible	**08**		**5**
Pavement & rigid pavement - types and causes,			
Condition surveys and surface evaluation for unevenness,			
Rut depth, profilometers, bump integrators, falling weight deflectometer.			**5**
Failures of pavements: causes and remedies, maintenance and rehabilitation of pavements strengthening of pavements,			**5**
Benkleman beam deflection study, falling weight deflectometer.			**5**
	08		

References							
Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
	Pavement Design	Srinivasa Kumar, R	Orient Black Swan	2013	✓	-	-
	Pavement Evaluation and Maintenance Management System	Srinivasa Kumar, R	Universities Press (India) Private Limited	-	✓	-	-
	Principles of Pavement Design	H.J.Yoder and Witczak	John wiley and sons.	-	-	-	✓
	Highway Engineering	Khanna O.P, Justo C.G	Nem Chand Publishers	-	✓	-	-
	MOST SPECIFICATIONS FOR ROAD & BRIDGES	Ministry of Surface Transport (Roads Wing)	Published by Indian Roads Congress	1997	✓		

List of Code/Handbook			
Applicable for Unit No.	**Title of Code**	**Type of code**	**Year of Publication**
	IRC-37: (Latest Code) Guide lines for Design of Flexible Pavement	IRC	
	IRC-58: (Latest code) Guide lines for Design of Plain Jointed Rigid Pavement for highways	IRC	

(Dr. A.N. Dabhade)
BOS Member

(Dr. Avinash N Shirkhande,)
BOS (Civil Engg) Chairman

RASHTRASANT TUKDOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
SCHEME OF EXAMINATION & EVALUATION
B. TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)
SEMESTER: EIGHTH

Sr. No	Subject Code	Subject	Workload in Hours			Credit				Marks					Minimum passing marks	
			L	T/A	P	L	T	P	Total	Theory Int	Theory Uni	Practical Int	Practical Uni	Total	Theory	Practical
1	BTCVE801T	Construction Methods And Equipment Management #	3	0	0	3	0	0	**3**	30	70	--	--	**100**	45	--
2	BTCVE802T	Digital Land Surveying And Mapping (DLS&M) #	3	0	0	3	0	0	**3**	30	70	--	--	**100**	45	--
3	BTCVE803T	Disaster Management #	3	0	0	3	0	0	**3**	30	70	--	--	**100**	45	--
4	BTCVE804P	Project Work Phase-II	0	0	12	0	0	6	**6**	--	--	100	100	**200**	--	**100**
TOTAL			9	0	12	9	0	6	15	90	210	100	100	500		

Note:

1. These # subjects **(BTCVE801T,BTCVE802T& BTCVE803T)** should be undertaken through online mode by using NPTEL/SWAYAM /MOOCS Platforms **OR** through regular classroom teaching in Department of Civil Engineering of affiliated Colleges. Examinations will be conducted by RTMNU.
2. Project Work Phase-II shall consist of detailed report of continued project work from 7th Semester or internship in industry or at appropriate work place.

M.G.Pathan 2/6/23

02/06/2023 (Dr. A.N. Dabhade)

(Dr. Ranjit Patil)

02/06/23 Dr. N.R. Dhange

02/06/2023 (Dr. K N Kadam)