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

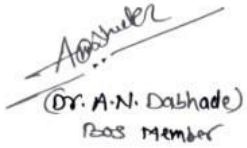
columns, Perry- Robertson approach and IS provisions. Design of rolled I, angle and Chanel sections.			
	8		
Unit No.3 (Design of Members subjected to Bending.)			
Simple Beam: Elastic and plastic behaviour, flexural strength, Low and high shear cases, deflection, web buckling and web crippling effect. 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		

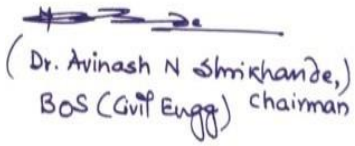
References

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

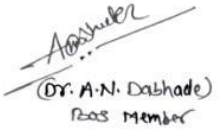
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Subject Code &CO NO.												
CO1	3	3	3	-	2	-	-	2	-	3	-	3
CO2	3	3	3	-	2	-	-	2	-	3	-	3
CO3	3	3	3	-	2	-	-	2	-	3	-	3
CO4	3	3	3	-	2	-	-	2	-	3	-	3
CO5	3	3	3	-	2	-	-	2	-	3	-	3
Avg CO	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**2**	**-**	**3**	**-**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

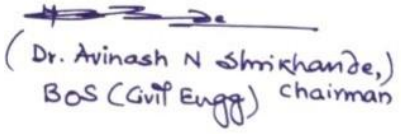
1 Low 2 Medium 3 High

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	

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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	

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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	✓	-	-

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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		

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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		

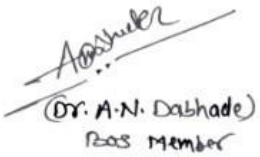
UNIT NO.4 Sheet piles & Cofferdams			
Cantilever sheet piles and anchored bulkheads: Earth pressure diagram, determination of depth of embedment in sands and clays, timbering of trenches, Earth pressure diagrams, forces in struts.	**03**		**4**
Cofferdams: Stability, bearing capacity, settlements (qualitative 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		

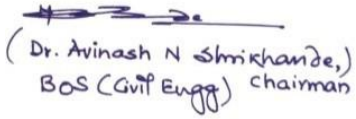
References

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

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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

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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

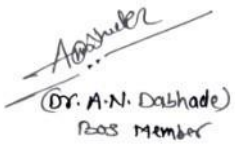
Unit No.1 Introduction			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
sources of energy, importance of water power, Hydropower development, Estimation of water power potential	**03**		**1**
Types of hydro power plant : classification of hydel plants, Run of river 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		

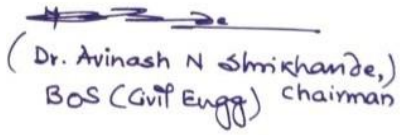
Unit No.2 Water Conveyance System &Penstock			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Power Canals, Alignment, Design criteria for Power canals, Flumes, Covered conduits and Tunnels	**03**		**2**
Penstocks: general classification; design criterion; economical 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		-	✓

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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): 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/

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(Dr. A.N. Dabhade) BoS Member

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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	**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

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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**

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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 : 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**		

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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:	**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		

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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): 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	

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B.TECH CIVIL ENGINEERING (CHOICE BASED CREDIT SYSTEM)

Sem: VIII	**Total Hours Distribution per week**		
Total Credit: 03	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 0 Hrs**	**Practical (P): 0 Hrs**
Subject Code	**BTCVE 801T**	**Name of Subject: Construction Method and Equipment Management**	

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 have knowledge about construction industry and construction projects.
2	To know about project organization.
3	To understand construction planning methods.
4	To understand construction labour and equipment management.
5	To have knowledge about construction materials management.

Course Outcome	
After completion of syllabus student able to	
1.	Should have the knowledge about construction industry and construction projects.
2.	Should have knowledge about project organization.
3.	Should have knowledge about construction planning methods.
4.	Should have knowledge about constructionlabour and equipment management.
5.	Should have knowledge about construction materials management.

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 Construction Industry and Constructions Projects			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction - Types of Construction, Selection of Professional Services, Construction Contractors, Legal and Regulatory Requirements, Changing Environment of the Construction Industry.	**04**		**1**
Role, responsibility of projects Manager, Role of PMC (Project Management Consultants) on major projects. Various construction Equipment's with its Advantages, Disadvantages and its Use	**02**		**1**
Importance of construction industry, Phases of a construction project, participants or stakeholders of a construction project.	**02**		**1**
	08		
Unit No.2 Project Organization			
	Allotment of Hours		**Mapped with CO**

Details of Topic			Number
	L	T/A	CO
Construction company, forms of business organization, structure of construction organization	02		2
organizing for project management, management levels, traits of a project manager	02		2
Traits of a project co-ordinator, ethical conduct for engineers, factors behind the success of a construction organization	03		
	07		

Unit No.3 Construction Planning

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Work break down structure, Planning Techniques- terminologies used, bar charts,Milestone charts, preparation of network diagrams	02		3
Activity cost and time estimation in PERT and CPM techniques, Line of Balance Technique, network technique advantages.	003		3
Precedence Network Analysis, software's in Construction scheduling (MSP, primavera).	02		3
	07		

Unit No.4 Construction Labour and Equipment Management

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Need for legislation, Acts regarding fixing terms of employment, Acts regarding providong proper workling conditions.	02		4
Acts regarding social security, need for mechanization, financial aspects of construction plants and equipments.	02		4
factors affecting selection of construction equipments, planning of construction equipments, factors affecting the cost of owning and operating the construction equipments.	03		

	07		

Unit No.5 Construction Materials Management

Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Importance of material management and its role in construction industry, material management functions, Material Procurement Process in construction organization,inventory management.	**03**		**5**
inventory related costs, functions of inventory,ABC analysis, Economic Order Quantity Model, I	**03**		**5**
Integrated approach to materials management, Role of materials manager.	**01**		
	07		

References

Applicable for Unit No.	**Name of Book**	**Name of Author**	**Name of Publisher**	**Edition**	**Category**		
					Text Book	**Research paper**	**Reference book**
1,2	Scheduling Construction Projects, John Wiley & Sons, 1986. CN7204	Willis, E. M.			√		
4	Civil Engineering Contracts and Estimates - Universities Press	B. S. Patil –					√
1,2,4	The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional				√		

	Book						
1,2,5	Law of contract Part I and Part II, Dr. 2005 Edition, Allahabad Law Agency	R.K. Bangia-					√

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

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BOS Member

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

Sem: VIII	**Total Hours Distribution per week**		
Total Credit:03	**Lecture (L): 3Hrs**	**Tutorial/Activity (T/A): 0 Hrs**	**Practical (P): 0 Hrs**
Subject Code:	**BTCVE802T**	**Name of Subject: Digital Land Surveying & Mapping**	

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 digital land surveying and its application
2	To provide basics of digital surveying and mapping of earth surface using total station, GPS and mapping software.

Course Outcome	
After completion of syllabus student able to	
1	Know the basics of digital land surveying and its applications.
2	Handle the GPS for surveying and plot the details on map.
3	Know the use of DGPS and its applications and advantages.
4	Use total station for land surveying and plotting the details.
5	Use advance software for mapping.

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
Subject Code &CO NO.												
CO1	1	--	--	--	1	--	--	--	1	--	--	1
CO2	2	1	2	--	3	-	--	--	1	--	--	1
CO3	2	1	2	--	3	--	--	--	1	--	--	1
CO4	2	1	2	--	3	--	--	--	1	--	--	1
CO5	2	1	2	--	3	---	--	1	1	2	--	2

1 Low 2 Medium 3 High

SYLLABUS

Unit No.1 INTRODUCTION TO SURVEYING			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Overview of general survey: Introduction , Need , Application and Types	**02**		**1**
Overview of digital land survey:- Introduction, Establishment of control points.	**03**		**1**
Introduction to advanced digital surveying methods.	**03**		**1**
	08		
Unit No.2 GPS			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction , components	**01**		**2**
GPS signals: Introduction , GPS signals , GPS user segment: Introduction, GPS Receiver code receiver , frequency receiver	**02**		**2**
GPS software – Field software , office software	**02**		**2**
GPS data collection and processing , ERRORS IN GPS	**03**		**2**

OBSERVATION			
	08		
Unit No.3 DGPS and Data processing			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction to Differential GPS	**02**		**3**
DGPS data application and Processing	**03**		**3**
DGPS control station and loop closure technique	**03**		**3**
	08		
Unit No.4 TOTAL STATION			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Introduction, parts , accessories and setting of total station	**02**		**4**
Measurements of distance , horizontal angle, vertical angle and height, Contouring and mapping	**03**		**4**
Errors in Total station , errors and error propagations and survey specification	**03**		**4**
	08		
Unit No.5 MAPPING			
Details of Topic	**Allotment of Hours**		**Mapped with CO Number**
	L	**T/A**	**CO**
Mapping fundamentals , basics	**02**		**5**
Mapping software and Automated Mapping	**02**		**5**
Working steps and establishment of control point	**02**		**5**
Detailing of digital surveying	**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 to V	Digital Land Surveying and Mapping	P.K.Garg	New Age International Publisher		**Y**		
II, IV	Advanced Surveying: Total Station, GPS, GIS & Remote Sensing	GopiSatheesh, R.Sathikumar, N Madhu	Pearson	2017	**Y**		

Course Co-ordinator

(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: VIII	**Total Hours Distribution per week**		
Total Credit:	**Lecture (L):00 Hrs.**	**Tutorial/Activity (T/A): 0 Hrs.**	**Practical (P): 12 Hrs.**
Subject Code	**BTCVE804P**	**Name of Subject: Project Work Phase-II**	

Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
100 Marks	**100 Marks**	**100 Marks**	**--**

Course Objective	
1	The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under Project Phase-I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry.

Course Outcome	
After completion of syllabus student able to	
1	Analyze or Design the Civil Engineering problems by using appreciate methodology in a team work.
2	Interpret the communication skills of team members
3	Use of Modern tools in the field of Civil Engineering

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

In continuation to semester VII work, the group of the students shall collect all necessary information pertaining to the project and analyses it. The group of the students shall prepare and submit a detailed report on the project.

The report shall be type written on A4 size papers and hard bound as per prescribed norms. Broadly the report shall include: Introduction, Literature Review, Problem definition, Data collection and analysis, Results (Numerical / Experimental), Conclusions and discussions.

Acquaintance with survey and research methods and their use in conducting systematic investigations, use of data analysis tools, computational methods and style of report, preparation and presentation shall form basis of evaluation. The group shall prepare and present a seminar based on this work before an external examiner.

(Dr. A.N. Dabhade)
BOS Member

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